



James Island Public Service District

Dedicated to Public Service Excellence

Sanitary Sewer System
Design and Construction Standards

July 2016

GRGA PN 1760-108



TABLE OF CONTENTS

1. INTRODUCTION
2. ADMINISTRATION
 - A. JAMES ISLAND PUBLIC SERVICE DISTRICT
 - B. DEVELOPER'S DESIGN ENGINEER
3. SUBMITTALS AND APPROVALS
 - A. GENERAL
 - B. PRELIMINARY APPROVAL
 - C. FINAL APPROVAL
 - D. SHOP DRAWINGS
 - E. OPERATION AND MAINTENANCE MANUALS
 - F. PROJECT COMPLETION AND TAKEOVER
 - G. PERMIT TO CONSTRUCT APPLICATION
 - H. PROJECT REVIEW CHECKLIST
 - I. O & M ACCEPTANCE CHECKLIST
 - J. AS-BUILT DRAWING CHECKLIST
 - K. JIPSD CLOSEOUT PACKAGE CHECKLIST
4. EASEMENTS
5. GRAVITY SANITARY SEWER SYSTEM DESIGN STANDARDS
 - A. GENERAL
 - B. GRAVITY SEWER SYSTEM DESIGN CRITERIA
 - C. CAPACITY DESIGN
 - D. INFILTRATION
 - E. SEWER PIPES
 - F. SEPARATION OF WATER MAINS AND SEWERS
 - G. COVER
 - H. DUCTILE IRON PIPE LOCATIONS
 - I. MANHOLES
6. GRAVITY SANITARY SEWER MATERIALS FOR CONSTRUCTION
 - A. GENERAL
 - B. PIPE AND FITTINGS
 - C. MANHOLES
 - D. PIPE AND MANHOLE FOUNDATION AND BACKFILL MATERIALS
 - E. CASING, SPACERS AND END SEALS FOR UTILITIES
7. GRAVITY SANITARY SEWER SYSTEM CONSTRUCTION PROCEDURES
 - A. HANDLING OF MATERIALS
 - B. PIPE CUTTING
 - C. LOCATING

- D. INSTALLATION
 - E. MANHOLES
 - F. MANHOLE COATINGS
 - G. CONNECTIONS TO EXISTING SYSTEM
 - H. SERVICE LATERALS
 - I. INSPECTIONS AND TESTING
 - J. GENERAL
 - K. TRENCH EXCAVATION
 - L. TRENCH BACKFILL
 - M. INSTALLATION OF CASING, SPACERS, AND END SEALS
8. FORCE MAIN DESIGN STANDARDS
- A. GENERAL
 - B. FORCE MAIN DESIGN CRITERIA
 - C. AIR RELEASE VALVES
 - D. PLUG VALVES
 - E. FORCE MAINS ENTERING MANHOLES
 - F. SEPARATION OF FORCE MAINS AND WATER MAINS
 - G. COVER
 - H. DUCTILE IRON PIPE LOCATIONS
9. FORCE MAIN MATERIALS FOR CONSTRUCTION
- A. GENERAL
 - B. PIPE AND FITTINGS
 - C. RESTRAINED JOINT PIPE AND FITTINGS
 - D. AIR RELEASE AND VACUUM VALVES
 - E. CASING, SPACERS, AND END SEALS FOR UTILITIES
10. FORCE MAIN CONSTRUCTION PROCEDURES
- A. HANDLING OF MATERIALS
 - B. PIPE CUTTING
 - C. LOCATING
 - D. ALIGNMENT OF PIPE
 - E. PLACING AND LAYING
 - F. INSTALLATION OF AIR RELEASE VALVES
 - G. INSPECTIONS AND TESTING
 - H. INSTALLATION OF CASING, SPACERS, AND END SEALS
 - I. TRENCH EXCAVATION
 - J. TRENCH BACKFILL
11. SANITARY SEWER PUMP STATION DESIGN STANDARDS
- A. GENERAL
 - B. GENERAL PUMP STATION DESIGN
 - C. SUBMERSIBLE PUMP STATION

- D. PUMPS AND MOTORS
 - E. PUMP STATION PIPING
 - F. WETWELL DESIGN CRITERIA
 - G. ELECTRICAL
 - H. PUMP STATION SITE
 - I. SPARE PARTS FOR SUBMERSIBLE PUMP STATION
- 12. SANITARY SEWER PUMP STATION MATERIALS FOR CONSTRUCTION
 - A. WETWELLS
 - B. SUBMERSIBLE PUMP STATION
 - C. GRINDER STATIONS
 - D. LEVEL CONTROL SYSTEM
 - E. CUSHIONED SWING CHECK VALVES
 - F. PLUG VALVES
- 13. SANITARY SEWER PUMP STATION CONSTRUCTION PROCEDURES
 - A. GENERAL
 - B. SUBMERSIBLE SEWAGE PUMPS
 - C. REMOTE TELEMETRY UNIT (RTU)
- 14. ALTERNATIVE WASTEWATER COLLECTION SYSTEMS (AWCS) DESIGN STANDARDS
- 15. SAND, OIL AND GREASE INTERCEPTOR
- 16. FORCE MAINS INSTALLED BY HORIZONTAL DIRECTIONAL DRILLING (HDD)
- 17. AWCS MATERIALS AND CONSTRUCTION PROCEDURES
- 18. JIPSD CLOSEOUT DOCUMENTS
 - A. AFFIDAVIT OF TITLE
 - B. AFFIDAVIT OF PROPERTY TRANSFER FEE
 - C. BILL OF SALE
 - D. CONTRACTOR GUARANTY AND WARRANTY
 - E. CONTRACTOR'S AFFIDAVIT AND FINAL WAIVER OF LIEN
 - F. GRANT OF PERPETUAL AND CONSTRUCTION EASEMENT
 - G. JIPSD PROJECT COMPLETION ENGINEER QUESTIONNAIRE
 - H. MAINTENANCE OF AGREEMENT SEWER
 - I. TITLE TO REAL ESTATE

19. STANDARD DRAWINGS

<u>DWG #</u>	<u>DETAIL NAME</u>
1	VALVE AND VALVE BOX
2	CONCRETE VALVE MARKER
3	JACK AND BORE
4	FORCE MAIN TIE-IN MANHOLE FOR 4" & 6" FORCE MAINS
5	AIR RELEASE VALVE MANHOLE
6	STANDARD MANHOLE
7	EXTERIOR DROP MANHOLE
8	FLAT TOP MANHOLE (SHALLOW MANHOLE)
9	TYPICAL TRENCH SECTION
10	TRENCH SECTION IN SCDOT RIGHT-OF-WAY
11	SEWER SERVICE WITH ELDER VALVE
12	TYPICAL PUMP STATION SITE PLAN
13	TYPICAL PUMP STATION TOP PLAN
14	TYPICAL PUMP STATION TOP PLAN (ALT.)
15	TYPICAL PUMP STATION SECTION
16	TYPICAL PUMP STATION VENT DETAIL
17	TYPICAL PUMP STATION FENCE WOODED FENCE
18	OPTION CHAIN LINK PUMP STATION FENCE
19	TYPICAL PUMP STATION CONTROL PANEL
20	PUMP STATION DUPLEX PUMP CONTROL PANEL
21	CONTROL PANEL INFORMATION PLATES
22	PRESSURE TRANSDUCER STILLING WELL
23	PUMP STATION PIPING AIR RELEASE VALVE
24	PUMP STATION FLOW METER
25	TYPICAL PUMP STATION ASPHALT DRIVEWAY SECTION
26	1,000 GALLON GREASE TRAP
27	HORIZONTAL DIRECTIONAL DRILLING (HDD) FORCE MAIN SECTION
28	HDPE TRANSITION
29	THRUST BLOCKING
30	GRINDER PUMP
31	TYPICAL GRINDER PUMP INSTALLATION
32	GRINDER PUMP SEPTIC TANK INTERCEPT
33	GRINDER PUMP SERVICE CONNECTION
34	LOW PRESSURE FORCE MAIN END-OF-LINE FLUSHING

20. JIPSD APPROVED MATERIAL MANUFACTURERS

1.

INTRODUCTION

SECTION 1

INTRODUCTION

An increase in development in Charleston County and rapid expansion of the sanitary sewer systems for the James Island Public Service District (hereinafter referred to as District) have resulted in the need for a quality standard for those systems being deeded to or constructed for the District. The benefits of standardization for the District include:

- A reduction in overall cost of operations and maintenance.
- A reduction in the total inventory of spare or replacement components.
- Familiarity with systems resulting in reduced down time during emergencies.

These standards have been adopted by the District and shall be incorporated into the design of all sanitary sewer system design and construction. The District realizes that there are occasions when extenuating circumstances occur, and these standards will not work in all situations. Developers wishing to deviate from the standards are to contact the following and clearly discuss the reasoning for a deviation prior to proceeding with any project:

James Island Public Service District
PO Box 12140
1739 Signal Point Road
James Island SC 29412
(843) 795-9060
Wastewater Superintendent

For very complex situations a meeting can be scheduled to discuss any deviations.

Copies of the “**SANITARY SEWER SYSTEM DESIGN AND CONSTRUCTION STANDARDS**” and “**STANDARD DRAWINGS**” can be obtained from the District’s website www.jipsd.org.

These standards will be subject to updates on a periodic basis.

If you have any comments concerning these standards, please feel free to contact the District.

The District will only consider for operation and maintenance of sanitary sewer systems installed:

1. Within the boundaries of the District service area.

2. In accordance with plans and specifications approved by the District and then only following the procedures outlined in these standards.
3. Prior to any project's approval the Developer must make the necessary arrangements with the District of the commitment of sanitary sewer system capacity. Projects cannot be submitted to the South Carolina Department of Health and Environmental Control (SCDHEC) until such commitments are obtained.

This Standard is intended to provide for the orderly design, permitting and construction of wastewater Projects within the James Island Public Service District. Each Project will be required to meet the material quality, design, and construction standards required by the District to ensure that wastewater facilities will allow cost-effective maintenance by the District and assure uninterrupted service to all wastewater customers in newly developed areas of the District.

This Standard is intended to be applicable to most new wastewater extensions for new development but may not be applicable, in part or whole, in every case. The District representative or District engineer will have the authority to interpret this Standard where specific, sufficient guidance is not provided. The District reserves the right to make changes to this Standard at anytime.

2.

ADMINISTRATION

SECTION 2

ADMINISTRATION

The following is a general description of the responsibilities of the parties involved with the design, review and approval of projects for the District.

A. JAMES ISLAND PUBLIC SERVICE DISTRICT

1. The District will review plans and specifications submitted and grant approval after all requested revisions, if any, have been completed.
2. The District will reserve the right to request changes in the work that is not in accordance with the District's Design and Construction Standards or if work is being performed in an improper manner that may result in incorrect installation of the sanitary sewer system.
3. All work rejected by the District shall be removed and redone to the satisfaction of the District.
4. The District reserves the right to request any work be uncovered if the work was covered contrary to the District's request, if defective work is suspected or to correct defects discovered during the District's inspections.
5. The District reserves the right to disallow work from an Engineer or Developer who consistently does not comply with the District's Design and Construction Standards.
6. The District reserves the right to request revisions to the Developer's or to the Developer's Design Engineer's plans for any discrepancies found during construction that may have been overlooked during review of the plans and specifications.

B. DEVELOPER'S DESIGN ENGINEER

1. The Developer's Design Engineer is the Engineer hired by a Developer or property owner to prepare a set of plans and specifications and/or an Engineer hired by a Developer who is responsible for construction administration of a project from plans and specifications prepared by another Engineer.
2. The Developer's Design Engineer will:
 - a. Prepare plans and specifications in accordance with the District's Design and Construction Standards, South Carolina Department of Health and Environmental Control Regulations and all other local, state and federal regulations pertaining to the project.

- b. Submit plans and specifications for review to the District.
- c. Make revisions necessary for the plans and specifications to comply with the District's Design and Construction Standards.
- d. Review all phases of the work in progress during construction. Conduct required testing of systems with the District's field representative.
- e. Promptly furnish the District with pertinent information concerning any changes which may be necessary during the progress of the work. No changes shall be performed without the prior written approval of the District.
- f. Obtain final approval from the District and applicable state and federal agencies.
- g. Comply with all applicable Final Approval and District acceptance requirements pursuant to Section 3.

3.

SUBMITTALS AND APPROVALS

SECTION 3

SUBMITTALS AND APPROVALS

In order to expedite the approval process of new sanitary sewer collection systems, the District has divided the process into the following: Preliminary Approval, Final Approval, Shop Drawings, Operation and Maintenance Manuals and Project Completion and Takeover. The submittals required for each part are described herein:

A. GENERAL

1. Developers shall prepare all necessary permits for any projects that are submitted to the District office for review. Copies of permits shall be forwarded to the District for final approval and signature.
2. All connections to the existing District sanitary sewer system must be approved and inspected by the District's personnel.
3. No sanitary sewer system shall be placed in operation until the Permit to Operate issued by the South Carolina Department of Health and Environmental Control (SCDHEC) is received by the District.
4. If a meeting is necessary between the Developer, the Developer's Design Engineer, and the District, an appointment should be made by calling the District's Wastewater office at (843) 762-5258.
6. Submittal packages are to be sent to the District as follows:

Wastewater Superintendent
James Island Public Service District
PO Box 12140
1739 Signal Point Road
James Island SC 29422-2140

B. PRELIMINARY APPROVAL

1. Developers, Designers, Planners, Engineers and others associated with implementing projects should meet with the District's Wastewater Superintendent to review plans and specifications and coordinate proposed projects with the District.
2. The Developer's Design Engineer shall submit a preliminary review package to the District. The package shall include the following:

- a. Two (2) sets of Plans and supporting documents shall include:
 - i. Complete system design including a tabulation of increased wastewater loading upon existing wastewater facilities that will transport wastewater generated by the proposed project; wastewater loading computations shall include peak flow rates and Average Daily Flow at Build-Out.
 - ii. Location and width of all the District's easements
 - iii. Indicate all rights-of-way as either public or private. Plans should also indicate ownership of existing roadways (Town, City, County or State). Indicate the agency to operate and maintain proposed roadways. Show all easements and rights-of-way and their ownership (SCE&G, Bell South, etc.)
 - iv. Draft copies of applicable SCDOT, Charleston County, City of Charleston, and/or Town of James Island encroachment permit applications for all work to be performed within public rights-of-way.
 - v. Preliminary copies of all required sewer easement plats for easements to be dedicated to the District.
 - vi. For all commercial developments, location of all proposed water and sewer services and size
 - vii. County Tax Map Reference Number of Property
 - b. Two (2) sets of typed and bound, or stapled, Specifications.
 - c. Two (2) copies of all design notes to include flow and Equilevent Residential Unit (ERU) calculations.
 - d. Engineers estimate of total construction cost.
3. The District will return to the engineer:
- a. Written design change comments and/or if applicable one (1) set of plans/specifications, which will indicate corrections if necessary or if none, written approval.
 - b. Notification of any required: encroachment applications, certifications, permits, or easements.
 - c. Request for any other required information pertinent to the proposed project.
 - d. Request a meeting with the engineer to review comments.

C. FINAL APPROVAL

1. Once preliminary approval is received the Developer's Design Engineer is to submit the following:

- a. Two (2) complete sets of Plans, Specifications, and design computations reflecting corrections requested by the District. These will be checked by the District before any approval letters, willing and able letters or any permits or signed by the District.
- b. Two (2) additional copies of the Site Layout Plan to be used by the District.
- c. All applicable SCDHEC, SCDOT, Municipal, and other required permit applications completed and ready for final approval and signature. All agency approved construction permits must be received by the District prior to obtaining final approval.
- d. Proposed construction schedule and notification in writing of commencement of work seven (7) days prior to starting construction. Construction inspection requirements shall be coordinated in advance with the District's Wastewater Superintendent.
- e. A pre-construction conference shall be held with the District. The District will require copies of the Contractor's safety training certifications and insurance certificates. A draft copy of the pre-construction agenda shall be provided to the District for review and comment fourteen (14) days prior to the coordinated conference date approved by the District. The Developer's Engineer shall provide an attendance list and minutes of the conference within seven (7) days following the conference date.

D. SHOP DRAWINGS

- 1. The District will review material and equipment shop drawings in compliance with the District's approved plans and specifications and the District's Design and Construction Guidelines. Provide two (2) sets for approval at the District's request.
- 2. Where applicable, shop drawings shall be accurately drawn to a scale and sufficiently large to show all pertinent aspects of the item and its method of connection to the Project.
- 3. Where contents of submittal literature from manufacturers include data not pertinent to the submittal, clearly show which portions of the contents are being submitted for review.

E. OPERATION AND MAINTENANCE MANUALS

- 1. Prior to start-up, provide the District with operation, maintenance, and service manuals (O&M Manuals) for each piece of equipment.
- 2. Prepare and submit three (3) copies of O&M Manuals for each piece of equipment.
- 3. The O&M Manuals will be prepared in the format that follows:
 - a. Manuals shall be specific to the equipment supplied.

- 1) Manuals applicable to many different configurations and which require the operator to selectively read portions of the instructions will not be accepted.
- 2) The equipment model that the manual applies to shall be indicated by an arrow.
- b. Table of Contents specific to each manual.
- c. At the beginning of each manual, provide a description of the equipment to include model numbers, purchase order numbers, serial numbers, motor information, and performance and design criteria.
- d. Correlate manuals with approved shop drawings and include the following minimum information:
 - 1) Parts list, including recommended spare parts list.
 - 2) Guarantees and warranties.
 - 3) Recommended maintenance instructions.
 - 4) Recommended lubricants and lubrication instructions.
 - 5) Address and telephone numbers of the source for repairs, spare parts, and service.
 - 6) Detailed description of operating procedures for the item of equipment specifically written for this installation, including start-up and shut-down procedures.
 - 7) Equipment performance specifications, including certified pump curves and start-up reports.
 - 8) Results of start-up and any further recommendations resulting from start-up.
- e. Provide a maintenance and lubrication schedule to be a summary of all preventative maintenance and lubrication, including the following information:
 - 1) Title
 - 2) Type of activity (inspection, adjustment, oil changes, etc.)
 - 3) Brief description of activity
 - 4) Type of lubricant
 - 5) Frequency (daily, weekly, etc.)
- f. Provide clear and legible copies. Type parts lists, etc.

- g. Layout and detail drawings shall be reduced to a maximum size of 11" x 17", unless written approval is received from the District prior to submittal of manuals.
- h. Provide a clearly labeled three-ring binder for manuals having thickness greater than 1/4".
 - 1) Provide sheet lifters.

F. PROJECT COMPLETION AND TAKEOVER

- 1. Upon completion of construction and prior to final inspection, the Developer's Design Engineer shall provide the following as one package:
 - a. Certify in writing that the sanitary sewer system has been constructed in accordance with the District's and SCDHEC's approved Plans, Specifications, applicable permits and acceptable engineering practice.
 - b. Two (2) sets of prints and one (1) set of white mylar reproducible (not sepia mylar) of "**As Constructed Record Drawings**". Record Drawings shall indicate all "as constructed" conditions for mains, and sewer lateral placement stamped by the Engineer in the format that follows:
 - 1) Show station marks at all valves, manholes, bends, sewer services and air release valves.
 - 2) Line lengths, pipe diameters, material type, pressure class/SDR, as constructed grades, and termination points.
 - 3) Valves are to be located by distance to two permanent reference points.
 - 4) Indicate top elevation of manholes and invert elevations of each conduit entering and exiting the manholes.
 - 5) Indicate State Plane Coordination for each system component included in subitems 1), 3), and 4) above.
 - 6) Reference benchmarks on drawings and tie to National Geodetic Vertical Datum of 1929 (NGVD29).
 - 7) Show all recorded plat and easement information on the mylar plan.
 - 8) Drawings must be clearly legible and of good quality.
 - 9) The District will review the "Record Drawings" **but the District is not responsible for the accuracy of record drawings**. If the drawings indicate inaccuracies, they will be returned to the Developer's Design Engineer for revisions and the system acceptance letter will not be issued until the drawings are acceptable.

- c. Provide two copies of CCTV video of all new gravity lines on CD. Contact the District for current rates and availability to perform the video inspection.
 - d. **Digital Data Submission:**
 - 1) The District has adopted geographic information systems (GIS) technologies to store, manage, and maintain spatially-related (geographic) data. The land development, engineering, and surveying communities have also embraced digital technologies in their respective professional communities. Because development plans are now created using computer aided design and drafting (CAD), it is the goal of The District to leverage such advanced techniques to expedite the design and plan review processes within the District. For such an effort to succeed, standards must be implemented to allow CAD data to be integrated into the District GIS while preserving the referential and positional accuracy of the original measurements.
 - 2) Contact the District for the latest standards for digital data submission.
 - e. The Developer shall provide the District with a Bill of Sale and Affidavit of Title, conveying the constructed system to the District's system and shall thereafter be owned, operated, and maintained by the District. Contact the District for standard forms.
 - f. As part of the conveyance, the Developer and/or the Developer's Design Engineer shall furnish the District with two (2) prints and two (2) recordable white mylars of each required easement plat.
 - 1) Each must have original signature and seal (do not use sepia mylar or plats larger than 22" x 34") as prepared in accordance with requirement set by the District and the RMC Office.
 - 2) Each easement plat shall be accompanied by a right-of-way easement instrument of conveyance.
 - 3) The Developer will record all easements and plats. The District will not accept compiled maps as land surveys.
 - 4) The width of the easements for sewer mains shall be a minimum of twenty (20) feet.
 - 5) All sewer mains within the easement shall be platted so as to provide equal distance on each side of the as-construction location of the main.
 - 6) **Plats shall not be accepted unless the five (5) requirements stated above are met.**
 - g. The Developer shall furnish Certified Contractor's Affidavit and Final Waiver of Lien.
2. Following complete submission and acceptance of the above items by the District, an on-site final inspection shall be scheduled with the District's Wastewater Superintendent to ensure that all construction complies with applicable District

requirements and standards and all project related wastewater facilities and appurtenances are operable.

3. When the above items are completed to the District's satisfaction, the District will issue an acceptance letter to SCDHEC with copies to all involved parties. Until such time as this letter is provided and SCDHEC's permit allowing the new wastewater facilities to be placed into operation has been received, WASTEWATER DISCHARGE INTO THE DISTRICT'S EXISTING WASTEWATER FACILITY SHALL NOT BE PERMITTED.

G. APPLICATION FOR PERMIT TO CONSTRUCT

**APPLICATION FOR PERMIT TO CONSTRUCT
WASTEWATER COLLECTION AND TRANSMISSION FACILITIES
JAMES ISLAND PUBLIC SERVICE DISTRICT
1739 SIGNAL POINT ROAD PHONE: (843) 762-5258
CHARLESTON, SC 29412 FAX: (843) 762-5252**

1. Project Name: _____

2. Location (street address and TMS Number): _____

3. Parent Tract Plat/Deed Ref. (RMC Book/Page): _____
4. Application is hereby made, on behalf of the Developer whose name appears below, for a Permit to Construct (describe): _____

5. Developer's name, address, telephone and FAX numbers: _____

6. Name, address, telephone and FAX numbers of Project Engineer/Authorized Agent: _____

7. Total ADF Wastewater Loading generated by this Project shall not exceed: _____
_____ GPD Maximum Peak Discharge Flow Rate _____
GPM
8. Is this part of a phased project? No _____ Yes _____ Phase _____ of _____
9. Is this project a revision to a previously permitted project? No _____ Yes _____
Project name (if different from this project): _____

JIPSD Permit Number: _____ Date: _____
SCDHEC Permit Number: _____ Date: _____
10. Type of wastewater generated by project (Check one):
Domestic _____ Process (Industrial) _____
11. A Complete Permit Application Package shall include the following items, as applicable:
A. _____ Application Fee; Ref. current JIPSD Fee Schedule.
B. _____ Transmittal letter detailing the submittal package.
C. _____ Copy of SCDHEC Application for Permit to Construct.
D. _____ Two (2) copies of the plans and Specifications signed, sealed and dated by the Project Engineer.
E. _____ Two (2) copies of the Project Engineering Report including hydraulic loading, pump station design calculations, pump curves, etc. The hydraulic loading shall be based upon SCDHEC "Guidelines for Unit Contributory Loadings to Wastewater Treatment Facilities" latest revision.

- F._____ One (1) original and three (3) copies of all applicable sewer/force main easement plats and (if applicable) fee simple pump station plats plus one (1) original developer executed deed for each.
- G._____ One (1) copy of each permit/certification required from each agency having Project jurisdiction.
- H._____ One (1) original and three (3) copies of each public Roadway Encroachment Permit Application required indicating the District as Applicant; submittals will be processed by the District and shall include Traffic Control Plans, HDD CheckLists, and HDD Frac-Out Plans when applicable.
- I._____ I hereby agree to invite JIPSD to the preconstruction conference for the project.
- J._____ I hereby agree that the JIPSD may issue a “stop work order” on the project if excessive complaints are received or for non-compliance of these guidelines.
- K._____ I hereby certify my acceptance of responsibility for the design of these wastewater facilities.

Engineer's Name (Printed): _____

Signature: _____

S.C. Registration No.: _____

- L._____ Prior to final District approval, I shall certify construction is complete in accordance with approved plans and specifications, to the best of my knowledge, information and belief as based upon periodic observations and final inspection for design compliance.

Engineer's Name (Printed): _____

Signature: _____

S.C. Registration No.: _____

- M._____ I have read this application and agree to the requirements and conditions stated herein. I hereby agree to allow project site access to District personnel for the purpose of periodic construction observation. I also hereby designate the Project Engineer as my Authorized Agent in all matters pertaining to the design and construction of the Project wastewater facilities. I understand that before the project can be finalized and ownership transferred to the District, a cash bond must be paid in the amount of 10% of the cost of project. Further I acknowledge that no connection to the public sewer shall be made until the Equivalent Residential Unit (ERU) fees have been paid.

Owner's Name (Printed): _____

Owner's Title: _____

Signature: _____ Date: _____

H. PROJECT REVIEW CHECKLIST

**JAMES ISLAND PUBLIC SERVICE DISTRICT
PROJECT REVIEW CHECKLIST FOR NEW DEVELOPMENT**

JAMES ISLAND PUBLIC SERVICE DISTRICT PROJECT NUMBER: _____

LOCATION: _____

DATE: _____

TMS#: _____

Project Engineer: _____

Developer: _____

Phone #: _____

Phone #: _____

Fax #: _____

Fax #: _____

PRELIMINARY APPROVAL (IF REQUIRED):

APPROVED

DATE

A. 2 sets of Plans, Specifications and
Engineering Reports

B. Transmittal Letter

C. District Permit Application

APPROVAL TO CONSTRUCT

A. Plans and Specification approved

B. DHEC and other required agency
Approvals submitted to the District

C. Construction Schedule (If required)

D. Notification of Date construction
Will commence.

Date actually started: _____

E. Roadway Encroachment Permits Approved

F. Wastewater Contract prepared and
Submitted for execution

G. Payment of all applicable fees;

Impact Fees \$ _____

Tap Fees \$ _____

Administrative Fees \$ _____

H. Preconstruction Conference;

Date Scheduled: _____

I. Identity of Resident Inspector

24/7 Phone #: _____

J. Identity of Job Site Superintendent

24/7 Phone #: _____

I. O & M ACCEPTANCE CHECKLIST

**JAMES ISLAND PUBLIC SERVICE DISTRICT
O&M ACCEPTANCE CHECKLIST FOR NEW DEVELOPMENT**

	<u>APPROVED</u>	<u>DATE</u>
A. Project Engineer's Request for District and DHEC for Final Inspection. Actual date: _____	_____	_____
B. Project Engineer's Certification of Completion and Acceptance.	_____	_____
C. "As-Built" Drawings furnished and accepted.	_____	_____
D. Instrument(s) of Conveyance furnished To the District	_____	_____
E. Pump Station Site and/or Sewer Easements	_____	_____
F. Maintenance Bond (%of total cost) \$_____	_____	_____
G. Payment of all Outstanding District Fees; Amount \$ _____	_____	_____
H. Contractor's Affidavit and Final Waiver of Liens	_____	_____
I. Project Completion Questionnaire	_____	_____
J. All Special Conditions of District and/or S.C. DHEC satisfied	_____	_____
K. District Final Inspection & Approval Date: _____	_____	_____
L. S.C. DHEC Permit to Operate Submitted; Date: _____	_____	_____
M. S.C. DOT/TOWN/COUNTY Encroachment Permit Conditions Satisfied; Date: _____	_____	_____
N. Date District Assumed O&M Responsibility: _____	_____	_____

J. AS-BUILT DRAWING CHECKLIST

**JAMES ISLAND PUBLIC SERVICE DISTRICT
AS-BUILT DRAWING CHECK LIST**

James Island Public Service District Project Number: _____

Checked by: _____

Date: _____

APPROVED

DATE

- | | | | |
|-----|---------------------------------------------------------------------------------------------------------------------|-------|-------|
| 1. | Lot Number(s) Ref S/D Plat | _____ | _____ |
| 2. | TMS Designations for each lot | _____ | _____ |
| 3. | Street Name(s) & R/W widths | _____ | _____ |
| 4. | Manholes Identified & Locations As-Built * | _____ | _____ |
| 5. | Line invert and Top Elevations of Manholes | _____ | _____ |
| 6. | Manhole Stations As-Built | _____ | _____ |
| 7. | Service Fittings Stations on sewer mains * | _____ | _____ |
| 8. | Depth at R/W of Service Line Fittings | _____ | _____ |
| 9. | Main Station at R/W of Service Line Fittings * | _____ | _____ |
| 10. | Service Line Distances | _____ | _____ |
| 11. | Reach Distances As-Built | _____ | _____ |
| 12. | Profile Grades As-Built | _____ | _____ |
| 13. | Contractor's I.D., Date Project Accepted for O&M | _____ | _____ |
| 14. | "Record Drawings" or "As-Built" | _____ | _____ |
| 15. | Project Engineer Seal & Certification | _____ | _____ |
| 16. | Equipment Operating Manuals (if applicable) | _____ | _____ |
| 17. | Pump Station Spare Parts (if applicable) | _____ | _____ |
| 18. | Force Main junction fittings, junction valves, Bend angles, Air-Release Valves, and Discharge manholes/structures * | _____ | _____ |

Note: All items above indicated with an asterick (*) shall include State Plane Coordinates.

K. JIPSD CLOSEOUT PACKAGE CHECKLIST

Project

Name: _____

Engineering Firm: _____

Date Closeout Package Submitted: _____

- ☐ Engineer's written certification that the sanitary sewer system has been constructed in accordance with the District's approved plans, specifications, applicable permits and good engineering practice
- ☐ Two (2) sets of prints and one (1) set of Mylar reproducible (not sepia Mylar) of "As Constructed Record Drawings" (As Builts) in the format specified in section 3.F.b. in the District's Design and Construction Standards
- ☐ Two (2) copies of video of all new gravity lines on CD
- ☐ One (1) AutoCAD/State Plane disk
- ☐ All original closeout documents with proper signatures and notarization including:
 - Affidavit of Title
 - Affidavit of Property Transfer Fee (if applicable)
 - Bill of Sale
 - Contractor Guaranty and Warranty
 - Contractor's Affidavit and Final Waiver of Lien
 - Grant of Perpetual and Construction Easement
 - JIPSD Project Completion Engineer Questionnaire
 - Maintenance of Agreement Sewer
 - Title to Real Estate (if applicable)
- ☐ Four (4) prints and two (2) recordable white Mylars of the easement plats in the format specified in section 3.F.f. in the District's Design and Construction Standards
- ☐ The Developer pays the District the cash bond in the amount of 10% of the Design Engineer's certified final construction cost of the wastewater facilities to be deeded to the District
- ☐ Completed and signed JIPSD Project Completion Engineer Questionnaire

4.

EASEMENTS

SECTION 4

EASEMENTS

1. Easements shall be conveyed to the District in a standard acceptable form.
2. The Developer will record all easements.
3. All sanitary sewer facilities shall be installed outside of pavement, curbing, and sidewalks unless approved otherwise by the District.
4. The width of the easements for sewer mains, and force mains shall be a minimum of twenty (20) feet.
5. Widths of easements for gravity sewers greater than eight (8) feet in depth shall be a minimum of thirty (30) feet.
6. Widths of easements for facility access roads shall be a minimum of twenty-five (25) feet.
7. All gravity sewers and force mains within easements shall be platted to provide equal distance on each side of the as-constructed utility.
8. Development related structures are not permitted within the easement.
9. Water and gravity sewers or force mains shall not be allowed in the same easement unless approved in advance by the Wastewater Superintendent. When approved increase the width of the easement to comply with the "Recommended Standards for Water and Sewer Works" ("Ten States Standard") with a distance from the edge of the easement to the sewer main not less than ten (10) feet.
10. Clear all easements of undergrowth and debris. The easement is to be grassed unless other landscape and/or hardscape placement is specifically approved by the District. Adhere to all applicable County and Municipal tree ordinances.
11. AWCS pumps and small diameter force mains on private property shall require applicable easements allowing the District to maintain the pump and force main.

5.

GRAVITY SANITARY SEWER SYSTEM DESIGN STANDARDS

SECTION 5

GRAVITY SANITARY SEWER SYSTEM

DESIGN STANDARDS

A. GENERAL

1. The following sanitary sewer system design guidelines are based on Federal, State and local health requirements and the District engineering design criteria.
2. These design guidelines are applicable to all developments including but not limited to residential, commercial and industrial developments, subdivisions and/or parks requiring sanitary sewer service from the District.

B. GRAVITY SEWER SYSTEM DESIGN CRITERIA

1. Minimum main line size: 8".
2. Service lines:
 - a. Minimum size: 6".
 - b. 6" service line may be provided, for no more than two residential units and only upon specific approval from the District.
3. Absolute Minimum pipe slope:
 - a. Main lines:
 - 1) 8-inch: 0.34%
 - 2) 10-inch: 0.26%
 - 3) 12-inch: 0.20%
 - 4) 15-inch: 0.15%
 - 5) 18-inch: 0.12%
 - 6) 21-inch: 0.10%
 - 7) 24-inch: 0.10%
 - b. Service lines:
 - 1) 4-inch: 1.00%
 - 2) 6-inch: 0.5%

- c. Sewers and Service lines found to be installed at less than the absolute minimum slopes indicated above shall not be accepted by the District and shall be reconstructed to provide the required minimum slopes indicated on approved Drawings prior to consideration for acceptance.

C. CAPACITY DESIGN

1. Comply with the unit contributory loading criteria, Appendix A of the South Carolina District of Health and Environmental Control Standards for Wastewater Facility Construction: R.61-67.

D. INFILTRATION

1. Maximum infiltration: 200 gallons per inch of pipe diameter per mile per day.

E. GRAVITY SEWER

1. Straight alignment, mandatory between manholes and/or cleanouts.
2. Depth adequate to receive wastewater from the lowest service and prevent freezing.
3. Slopes greater than 20%.
 - a. Anchor using approved concrete thrust blocking.
4. Where a smaller sewers discharge into manholes having larger downstream sewers, match crown elevations of each.
5. Service laterals and clean-outs/Elder valves: Locate one (1) foot off-set from sideline property corner on the opposite corner from the water service meter and service line when feasible.
6. Locate sewer mains and manholes outside of paved roadway when feasible.

F. SEPARATION OF WATER MAINS AND SEWERS

1. Where possible, locate sewer pipe at least ten (10) feet away, horizontally, from water lines.
2. Should ten (10) feet separation not be practical, then when approved by the Wastewater Superintendent, the sewer pipe may be located closer provided:
 - a. It is laid in a separate trench.

- b. It is laid in the same trench with the water main located at one side on a bench of undisturbed earth.
 - c. In either of the above cases, crown elevation of the sewer pipe shall be at least 18" below invert elevation of water line.
- 3. Where sewer pipes cross over or under water lines, maintain 18" minimum vertical clearance between outside edges of the two pipes and iron pipe may be required.

G. COVER

- 1. Provide suitable cover on all lines. Minimal cover depth as follows:
 - a. Less than 8" diameter: 36" unless DIP.
 - b. 8" and above: 36" unless DIP.
 - c. All piping located within the right-of-way of the South Carolina Department of Transportation shall have a cover of 48" below the crown of the road when installed within the limits of the paved roadway, 36" cover when installed in the shoulder of right-of-way and a minimum of 18" separation under the design invert of drainage structures. The greater dimension of the above shall dictate minimum depth where applicable.
 - d. Special conditions other than those listed above may be approved if requested in writing from the District.

H. DUCTILE IRON PIPE LOCATIONS

- 1. Use ductile iron pipe as follows:
 - a. Where sewer lines cross over water mains, the sewer main shall transition to ductile iron pipe. A full length of ductile iron pipe shall be installed in the sewer main centered so that each joint is equidistant from the water main. Joint of ductile iron pipe water main shall also be installed so that each joint is equidistant from the ductile iron pipe section of the sewer main.
 - b. Crosses beneath storm drainage pipe with less than three (3) feet of clearance.
 - c. Crosses above a storm drainage or other pipe with less than 18" of clearance.
 - d. Cover is less than the minimum 36" as in Part G above.

- e. The District reserves the right to require ductile iron pipe in specific locations.
- f. All ductile iron sewers and fittings shall be poly-wrapped and lined as specified elsewhere.

I. MANHOLES

- 1. Maximum manhole spacing: 400 feet maximum.
- 2. Minimal angle between sewer mains intersecting at manhole: 90°.
- 3. All manhole Top Elevations (TE) shall be higher than or equal to the fifty (50) year flood elevation designated for their applicable location, unless watertight/flood-proof ring and cover castings are provided.
- 4. Use outside drop manholes where the difference in incoming and outgoing pipe elevation is two (2) feet or greater.
- 5. Manhole materials and installations shall be in accordance with applicable District Standard Detail Drawings.
- 6. Steps shall not be allowed in manholes.

6.

GRAVITY SANITARY SEWER MATERIALS FOR CONSTRUCTION

SECTION 6
GRAVITY SANITARY SEWER
MATERIALS FOR CONSTRUCTION

A. GENERAL

1. Unless otherwise noted or approved by the District all materials shall be manufactured in the United States.

B. PIPE AND FITTINGS

1. Pipe Size and Type Selections:
 - a. On depths of 1 feet to 3 feet, use DIP.
 - b. On depths of 3 feet to 12 feet, use PVC SDR-26 unless DR18 C900/C905 is required by the District.
 - c. On depths of 12 feet to 16 feet, use DR11 PVC C900/C905, or DIP.
 - d. On depths greater than 16 feet, use DR9 PVC C900/C905, or DIP as specified below.
2. Ductile-iron pipe and fittings (DIP):
 - a. Ductile Iron Pipe shall be manufactured in accordance with ASTM A-377, L.R. and shall be Pressure Class 350 (4" – 12") or Pressure Class 250 (14" – 20") pursuant to ANSI A21.50 with a standard outside coating of coal tar or asphalt base material and inside lining as defined below. Ductile Iron Pipe shall have restrained mechanical joints or flanged joints as required. Pipe joints including gaskets shall meet the requirement of ANSI A21.11 (AWWA C111).
 - b. Use wall thickness in accordance with Section 7 for depth and bedding conditions.
 - c. Use fittings with pressure rating of 150 psi: ANSI/AWWA C110/A21.10 or C153/A21.53.88.b.
 - d. All bolts, tee-bolt and fasteners shall be 316 SS; all nuts shall be 304 SS to prevent galling.
 - e. Lining and Coatings:

- 1) Amine cured ceramic filled, Novalac Epoxy lining, 40 mils nominal thickness.
 - 2) Acceptable products:
 - a) Protecto 401 Ceramic Epoxy Vulcan Painters, Birmingham, Alabama, Permite Permax 9430 Type II, PERMOX-CTF or District approved polyethylene lining having a minimum 40 mils nominal dry thickness.
 - 3) Provide polyethylene encasement of all Ductile Iron pipe and fittings. Minimum nominal thicknesses of 8 mils conform to AWWA C105.
- f. When transition is required from PVC sewer main to ductile iron pipe sewer main, restrained mechanical joint DI fittings shall be used. No Fernco couplings will be allowed.
- g. All DIP gravity sewer installations shall also include the installation of an electronically or magnetically detectable safety tape buried directly over the pipe 12" below the ground surface continuously.
- 1) The tape shall be at least 2" wide, be green on top, and be boldly labeled every 18" to 32" as follows "CAUTION SEWER LINE BURIED BELOW".
 - 2) The tape shall have a tensile strength of not less than 4000 psi, a dart impact strength of not less than 120 grams per 1.5 mils, be not less than 0.0055" thick, and include sufficient metal to allow easy detection at the above stated depths.
 - 3) The tape shall be designed to last as long as the pipe it is installed over, even in adverse soils.
3. Polyvinyl chloride pipe and fittings (PVC):
- a. PVC gravity sewer pipe and fittings shall have a maximum SDR of twenty-six (26) and a maximum allowable deflection of five (5) percent. PVC gravity sewer pipe shall be furnished and installed in standard lengths of twelve (12) feet, six (6) inches. All pipe, fittings and accessories shall be of the same manufacturer and have identical bell and spigot configuration as the pipe utilized, except that all fittings shall be monolithically manufactured.
 - 1) Pipe and fittings shall exhibit homogeneous physical properties throughout and free from cracks, holes, inclusions or other defects.

- 2) Pipe shall not exhibit evidence of splitting, cracking or breaking when flattened by sixty (60) percent of its exterior diameter between parallel plates and shall not flake or disintegrate when tested in accordance with ASTM Standard Specifications D-2444, latest revision.
 - 3) Pipe identification and marking shall include size, manufacturer, use identification and other applicable requirements of ASTM Standard Specifications F-794, latest revision.
- b. Where specifically required by the District, PVC gravity sewer pipe/service lines and fittings shall conform to the requirements of ANSI/AWWA C900 Table 2, Pressure Class 150 and C905 Table 2, Pressure Class 165.
 - c. All PVC gravity sewer installations shall also include the installation of an electronically or magnetically detectable safety tape buried directly over the pipe 12" below the ground surface continuously.
 - 1) The tape shall be at least 2" wide, be green on top, and be boldly labeled every 18" to 32" as follows "CAUTION SEWER LINE BURIED BELOW".
 - 2) The tape shall have a tensile strength of not less than 4000 psi, a dart impact strength of not less than 120 grams per 1.5 mils, be not less than 0.0055" thick, and include sufficient metal to allow easy detection at the above stated depths.
 - 3) The tape shall be designed to last as long as the pipe it is installed over, even in adverse soils.
 - d. Provide polyethylene encasement of all Ductile Iron pipe and fittings. Minimum nominal thicknesses of 8 mils conform to AWWA C105.
4. General Information
 - a. All materials used in the construction of sewers shall be new and unused when delivered on-site and shall be suitable for installation and operation under the conditions for which they are to be used.
 - b. Casing pipes shall be installed at:
 - 1) highway crossings, as directed by SCDOT, or;
 - 2) as designated by the District.
 - c. No sewer line of any type shall be allowed to pass through any storm drainage structure unless approved by the District.

C. MANHOLES

1. Use precast manholes:
 - a. Comply with ASTM C478.
 - b. Portland cement: ASTM C150, Type II, 4,000 psi and absorption shall not exceed 6%.
 - c. The minimum wall thickness of the manhole riser sections shall be:

4' Diameter	5"
5' Diameter	5"
6' Diameter	6"

Cone sections shall have a minimum wall thickness of 8" at their top.
 - d. Monolithic base slab with walls. Bottoms cast with invert and bench are acceptable.

Minimum thickness of bottom:

4' diameter	6"
5' and 6' diameter	8"
 - e. Flat slab top sections: HS-20 traffic loadings.
 - f. Suitable openings for inlet and outlet sewer pipe shall be cast into the base sections and into riser sections for drop connections. These openings shall be circular, accurately made, and located as required for each manhole. Base riser sections shall be set on compacted #57 stone, 12" minimum thickness.
 - g. Provide flexible pipe boots conforming to ASTM C923m. Attach boot to piping with dual stainless steel straps.
 - h. The manhole sections may be jointed with either O-ring seals or butyl rubber type sealer.
 - 1) If O-rings are used, they shall conform to ASTM C443 and shall be set in a rectangular groove cast into the tongue section of each manhole. O-rings shall be installed as recommended by the manhole manufacturer.
 - 2) If butyl rubber sealer is used it shall be "Ram-Nek" joint sealer or equal. "Ram-Nek" shall be set on only clean and dry surfaces and placed as recommended by the manufacturer.

- 3) After manhole sections are joined, the inside of the joint shall be covered with a smooth tapered coat of premixed non-shrink grout to a thickness of ½" at the joint.
 - 4) The exterior of all manhole joints shall be wrapped with minimum 12" wide exterior joint seal wrap by Mar-Mac Manufacturing or District approved equal.
- i. Manhole inverts shall be constructed of cement grout and shall have the same cross section as the invert of the sewers which they connect. The manhole invert shall be carefully formed to the required size and grade by gradual and even changes in sections. Changes in direction to flow through the sewer shall be made to a true curve with as large a radius as the size of the manhole will permit. Concrete brick will be used only to form the invert channel walls. All other annular space shall be filled with non-shrink concrete grout. No fillers such as broken block, gravel, sand, or excavated material, are allowed. When dissimilar pipe sizes occur, the elevation of the crown of the pipes must be the same.
 - j. Manhole sections shall be free from large honeycomb, cracks, spalls, large chips, exposed reinforcing, and broken bells or spigots. Allowable deviation in form joints shall be ¼". Edges of bells and spigots shall be even and straight.
 - k. Size lift holes and inserts for a precision fit with the lift devices.
 - 1) Do not penetrate through the manhole wall.
 - 2) Comply with OSHA Standard 1926.704.
 - l. Provide flat slab tops where manhole depth is less than 4'-0".
 - m.

<i>Standard Manholes Schedule of Governing Dimensions</i>	
Pipe Size	Manhole Diameter
8" to 15"	4' - 0"
16" to 30"	5' - 0"
36" to 42"	6' - 0"

2. Exterior joint collar:
 - a. Install an exterior joint collar on all manhole joints.

- b. Provide a 12" wide band.
 - c. Acceptable product: Seal Wrap Exterior Joint Sealer by Mar-Mac Manufacturing Company.
3. Frames and covers:
- a. Manhole frames and covers shall be Class 400 ductile iron conforming to ASTM A 536-80 and also meet ASSHTO-H20 loading requirements.
 - 1) The frame shall have a clear opening of 24" and shall be 4" high. Cover shall sit on a polyethylene gasket and lock automatically.
 - 2) All castings shall be made accurately to the required dimensions and pattern. The castings shall be sound, smooth, clean and free from blisters and other defects.
 - 3) Castings which have been plugged or otherwise repaired shall be unacceptable for use.
 - 4) The contact surface between the cover and supporting ring shall be machined to make contact on the complete perimeter.
 - 5) Watertight/flood-proof castings shall be required as specified in subsection 5.I.3.
 - b. Frames and covers located within paved surfaces shall be heavy duty Ductile Iron Model USF 480 ring and RA-SSG cover as manufactured by US Foundry and Manufacturing or approved equal Manufacturers.
 - 1) For manholes located within unpaved areas, frames, and covers shall be Pamrex Model 621131 as manufactured by Certainteed, or approved equal.
 - 2) Cast into the cover shall be the words "JIPSD SANITARY SEWER". Letters shall be 3" high.
 - c. Leveling and final grading of manhole frames and covers shall be accomplished by using a maximum of two (2) 4" concrete grade rings or one (1) 6" grade ring.
 - 1) Use cement brick for adjustments less than 4". The total number of grade rings shall not exceed 8" in thickness.

- 2) Grade rings and cement brick shall be laid in a full bed of non-shrink grout and covered after laying with a smooth coating of non-shrink grout or hydraulic cement a minimum of ½" thick.
- d. After the manhole has been set in its final position, the cast iron frame for the cover shall be carefully set at the required finished grade and properly bonded to the masonry with non-shrinking cement grout or hydraulic cement.
- 1) Where manholes are constructed in paved areas, sidewalks, etc., the top surface of the frame and cover shall be set at a profile slope to conform to the exact slope crown and grade of the existing or new pavement as applicable.
- e. Provide circular cover with two (2) pulls for removing manhole cover, spaced at 180 degrees and weighing not less than 120 pounds.

5. General

- a. All manholes over 12' deep shall be reviewed during design with the District.
- b. Where the difference in the invert elevation between an intersecting sewer and a manhole is 2' or more, a drop manhole shall be constructed similar to the standard District manhole except that a drop connection of pipe and fittings of the proper size and material shall be constructed outside the manhole.
- c. Where the work requires special tidal creek, river or other extraordinary conditions, or where alternate types of construction that are not covered by these specifications, the materials and construction methods shall be submitted for approval to the District.

D. PIPE AND MANHOLE FOUNDATION AND BACKFILL MATERIALS

1. Pipe Bedding Materials

- a. Compacted crushed stone complying with SCDOT Aggregate No. 57.

2. Backfill Materials

- a. Reuse of existing excavated materials will be allowed provided the materials are compactable, dried or dampened to their optimum moisture content, are free from roots, large clods of clay, and are granular and non-cohesive in nature.

- b. Select fill shall be non-cohesive USCS GW, GP, SW, or SP free from debris, roots, wood, scrap material and other vegetal matter with a maximum of 10% passing a wash #200 sieve when tested in accordance with ASTM D1140 and a maximum Liquid Limit of 10%.
- 3. Manhole Bedding Materials
 - a. Shall be crushed stone as noted in Section D.1.a.

E. ENCASED UTILITIES UNDER ROADWAY CROSSINGS

- 1. General
 - a. Provide Jack and Bore with casing for pipes larger than 2".
 - b. Casing pipe to be a minimum of 2" larger in diameter than the bell of the carrier pipe based on the following:
 - 1) Casing pipe to be a minimum of 2" larger than the largest outside diameter of the carrier pipe (joints and couplings) for carrier pipe less than 6" in diameter. When the diameter of the carrier pipe is 6" or larger, the diameter of the casing pipe shall be a minimum of 4" larger than the largest outside diameter of the carrier pipe (joints and couplings).
 - 2) The end of casing pipe to extend a minimum of five (5) feet from the edge of pavement/back of curb. Unless otherwise approved by the SCDOT permit.
 - 3) The top of the casing pipe shall be a minimum of four (4) feet below the crown of the finished asphalt roadway.
 - 4) The top of the casing pipe shall be a minimum of two (2) feet below the design invert of roadside drainage ditches and pipes.
- 2. Casing pipe for dry bores
 - a. Steel complying with ASTM A139 for Grade B with minimum yield strength of 35,000 psi.
 - b. Provide ends suitable for field welding.

b. Minimum wall thickness as follows:

<u>Diameter of Casing</u> (Inches)	<u>Minimum Wall Thickness</u> (Inches)
6 thru 14	1/4
16 and 18	5/16
20 and 22	3/8
24 and 26	7/16
28 thru 32	1/2
34 thru 42	9/16
44 thru 48	5/8
50 thru 54	3/4

3. Pipeline casing spacers:

- a. Provide pipeline casing spacers for piping installed in casing.
- b. Provide a minimum of one spacer per ten linear feet of pipe for ductile iron pipe and a minimum of one spacer per six linear feet for PVC pipe.
- c. Provide spacer with shell of 14 gauge Type 316 stainless steel.
- d. Provide shell liner of .090" thick PVC, 85-90 durometer.
- e. Provide 5/16" stainless steel connecting bolts and lock nuts, minimum three (3) per flange.
- f. Runners from 2" wide ultra high molecular weight polymer with a high resistance to abrasion and a coefficient of friction of 0.11-0.13 in accordance with ASTM D-1894.
- g. Support runners on 14 gauge reinforced Type 316 stainless steel risers welded to shell.
- h. All metal surfaces to be fully passivated.
- i. The diameter as measured over the runners shall exceed the pipeline bell or coupling outside diameter.
- j. Acceptable product: Cascade Manufacturing, Spider Manufacturing, Inc. or approved equal.

4. End seals:

- a. Provide 1/8" thick rubber end seal to seal each end of the casing.
- b. Secure to casing and carrier pipe with T-304 stainless steel bands.

- c. Acceptable manufacturers: Cascade Manufacturing, Pipeline Seal and Insulator, Inc. or approved equal.

7.

GRAVITY SANITARY SEWER
SYSTEM CONSTRUCTION
PROCEDURES

SECTION 7

GRAVITY SANITARY SEWER SYSTEM

CONSTRUCTION PROCEDURES

This section covers construction procedures normally required for work. It does not cover any special construction procedures that may be encountered for abnormal conditions. Special construction procedures are to be presented to the District by the Developer's Design Engineer.

A. HANDLING OF MATERIALS

1. Storage and handling shall be in accordance with manufacturer's recommendation.
2. Storage of PVC pipe:
 - a. Store in unit packages as received from manufacturer until just prior to use.
 - b. Stack units to prevent deformation to pipe barrel and bells.
 - c. Protect from direct sunlight by covering with opaque material.
3. Avoid severe impact blows, gouging or cutting by metal surfaces or rocks.
4. Handle pipe so as to ensure delivery to the trench in sound, undamaged condition.
 - a. Carry pipe into position - do not drag.
 - b. Use pinch bars or tongs for aligning or turning the pipe only on the bare end of the pipe.
 - c. Use care not to injure pipe linings.
5. Thoroughly clean interior of pipe and accessories before lowering pipe into trench. Keep clean during layout operations by plugging or other approved method.
6. Before installation, inspect each piece of pipe and each fitting for defects:
 - a. Replace material found to be defective before or after laying with sound material meeting the specified requirements.

- b. Inspect the lining date for all DIP lined with P-401 and reject all pipe and fittings with dates beyond the published 2- year lining “shelf or use-by” date.
- 7. Rubber gaskets: Store in a cool dark place until just prior to time of installation.

B. PIPE CUTTING

- 1. Cut pipe neatly and without damage to the pipe. Bevel pipe to ensure final homing of pipe without damage to gasket.
- 2. Unless otherwise recommended by the pipe manufacturer, cut pipe with mechanical cutter only.
 - a. Use wheel cutters when practical.
 - b. Cut plastic pipe square and remove all burrs.

C. LOCATING

- 1. Sewer lines in relation to water lines must conform to “Ten States Standards”.
- 2. Locate sewer pipe at least ten (10) feet away, horizontally, from water lines.
- 3. Should ten (10) foot separation not be practical, if approved by the Wastewater Superintendent, then the sewer pipe may be located closer provided:
 - a. It is laid in a separate trench.
 - b. It is laid in the same trench with the water main located at one side on a bench of undisturbed earth.
 - c. In either of the above cases, crown elevation of the sewer shall be at least 18" below invert elevation of water line.
- 4. Where water lines cross over, maintain 18" minimum clearance between crown of sewer and invert of water lines.
- 5. Where sewer lines cross over water mains, the sewer main shall transition to ductile iron pipe. A full length of ductile iron pipe shall be installed in the sewer main centered so that each joint is equidistant from the water main. Joint of ductile iron pipe water main shall also be installed so that each joint is equidistant from the ductile iron pipe section of the sewer main.

6. When it is impossible to obtain proper horizontal and vertical separation as stipulated above, the sewer shall be designed and constructed equal to water pressure pipe, and shall be pressure tested to assure water tightness prior to backfilling.

7. Water Supply Interconnections

There shall be no physical connections between a public or private potable water supply system and a sewer, or appurtenances thereto which would permit the passage of any sewage or polluted water into the potable supply. No water pipe shall pass through or come in contact with any part of a sewer manhole.

8. Relation to Water Works Structures

While no general statement can be made to cover all conditions, it is generally recognized that sewers shall meet the requirements of the appropriate reviewing agency with respect to minimum distances from public water supply wells or other water supply sources and structures.

D. INSTALLATION

1. Trench, backfill and compact for the work of this Section in strict accordance with pertinent provisions of these specifications, and the following requirement:

- a. Gravity sewer trench widths, depths and bedding methods.

- 1) Install all sewers of the materials specified complying with tables for depths of cut and class of bedding included hereinafter.

- b. Ductile-iron pipe:

- 1) Ductile iron pipe shall only be installed where required as specifically specified elsewhere herein or where directed by the District. Otherwise, AWWA C900/C905 PVC pipe shall be the default material required.
- 2) DIP shall also be installed pursuant to Section 10.C where applicable conditions exist.

- c. Polyvinyl chloride pipe ASTM 3034 SDR-26 and ASTM (C900/C905):

MAXIMUM DEPTHS IN FEET		
PIPE SIZE	MAX. TRENCH WIDTH	Bedding Class B TYPE 2* ONLY
4"	2'0"	15
8"	2'2"	15
10"	2'4"	15
12"	2'6"	15
15"	2'10"	15
18"	3'2"	15
21"	3'6"	15
* Class B Bedding (Type 2) shall extend to the top of the pipe.		

- d. Bedding and tamping:

1) Class B (Type 1) Bedding:

- a) Shape bottom of trench to a level 2" below bottom of pipe; bring bed to proper level by spreading and thoroughly tamping fine granulated moist earth and sand to conform accurately to one-fourth circumference of pipe barrel; provide suitable material if not available from trench excavation; lay pipe, backfill and hand tamp in thin layers to height three-fourths of pipe diameter, using material same as bedding material; complete trench backfill as specified in the guidelines.
- b) In lieu of Class B (Type 1) bedding for Ductile Iron Pipe, Class B (Type 2) bedding may be used.

2) Class B (Type 2) Bedding:

- a) Undercut 4" below pipe barrel, full width of trench; bring to grade with compacted crushed stone complying with SCDOT Aggregate No. 57. For all pipe, place granite aggregate (SCDOT No. 57) in 6" layers to the top of pipe, compacting by slicing with shovel.
- b) Trench backfill complying with paragraph L under Section 7.
- c) Bedding shall be pursuant to the District's standard Trench Section Drawing unless directed otherwise.

2. Pipe laying:

a. General:

- 1) Protect pipe during handling against shocks and free fall. Remove extraneous material from the pipe interior.
- 2) Adequate dewatering/well point system equipment shall be provided to ensure a stable trench subgrade prior to placement of bedding aggregate.
- 3) Gravity sewer pipe installation must comply with ANSI/ASTM D2321 as the minimum acceptable standard as well as any additional requirements as stated herein.
- 4) Before sewer pipe is placed in position in the trench the bottom and sides to the trench shall be carefully prepared as per manufacturer's specifications. Each pipe shall be accurately placed to the exact line and grade called for on the plans. Laser equipment shall be used in setting pipe in lieu of the batter board method.
- 5) Pipe shall be laid in a full bed of crushed stone (SCDOT Aggregate No. 57). Pipe laying shall proceed upgrade, starting at the lower end of the grade and with the bells upgrade. Pipe shall be straight when placed in the trench. Trench bottoms found to be at incorrect grade after pipe laying operations have begun shall be corrected and brought to exact line and grade. Fill required shall be crushed stone.
- 6) After each line of pipe has been laid, it shall be carefully inspected and all earth, trash, rags, and other foreign matter removed from the interior.
- 7) Each joint shall be laid so that it will form a close concentric joint with adjoining pipe and so as to avoid sudden offsets.
- 8) All jointing of pipe and fittings shall be in accordance with the pipe manufacturer's recommendations.
- 9) Any leaks or defects discovered at any time after completion of the work shall be repaired immediately. All pipe in place shall be carefully protected from damage until the backfilling operations have been completed.

- 10) Water shall not be allowed to run through the pipe or stand in the trench.

b. Polyvinyl Chloride Pipe:

- 1) Use proper bedding as specified above.
- 2) Comply with ASTM D2321, except as otherwise specified herein or indicated on standard District Detail Drawings.

c. Ductile-Iron Pipe:

- 1) Use proper bedding as specified above.
- 2) Comply with ANSI/AWWA C600, except as otherwise specified herein.
- 3) Provide polyethylene encasement of all DI Pipe and DI fittings. Minimum nominal thickness of 8 mils conform to AWWA C105.

E. MANHOLES

1. Set bases level so that walls will be plumb.
2. Clean and inspect tongue and groove joints for damage.
3. Apply joint sealer, or ring gasket to wall section(s), set firmly in place to assure watertight joints.
4. Connect pipe boot to piping with dual stainless steel straps.
5. Grout lift holes from the outside using non-shrink grout.
6. Install exterior joint collar.
 - a. Follow manufacturer's recommendations.
 - b. Clean the surface.
 - c. Remove the protective paper and place the band around the manhole, mastic side to the manhole and spanning the joint.
 - d. Interior manhole steps shall not be approved for use by the District. For barrel sections having steps, remove same and fill all holes with approved non-shrink grout.

7. Form the invert channels directly in the concrete of the manhole base, with mortar and brick. Smooth the floor of the manhole outside the channels, and slope toward the channels at not less than 1" per foot or more than 2" per foot.
 - a. Shape the invert channels to be smooth and semi-circular, conforming to the inside of the adjacent sewer section. Inverts shall be to crown of pipe.
 - b. Make changes in direction of flow with a smooth curve of as large a radius as the size of the manhole will permit.
 - c. Make changes in size and grade of channels smoothly and evenly.
 - d. Slope invert uniformly from invert of inlet to invert of outlet.
8. Match manhole top to grade utilizing concrete grade rings or cement brick as specified, maximum height 8".

F. MANHOLE LININGS

1. Manholes shall be lined (new or existing) where directed by the District and, at a minimum, within all force main junction manholes and in the next three (3) manholes downstream.
2. The District reserves the right to require coatings in additional down stream manholes and all manholes five (5) feet inside diameter and larger.
 - a. Acceptable product for lining:
 - 1) Coatings meeting ASTM Standards, F-2551-9, C307, C508, as approved by the District.
 - 2) Raven405, Strong-Seal HP 100% Calcium Aluminate or other District approved lining.
 - b. Surface preparation:
 - 1) Follow all manufactures' recommendations for surface preparation for new or existing manholes.

G. CONNECTIONS TO EXISTING SYSTEM

1. Connections to existing manholes shall be made in the presence of the District. The Contractor shall notify the District 48 hours before starting a connection. All new holes in existing manholes shall be core drilled.

2. Construct new manhole over existing gravity main cutting upper half of existing pipe after base of manhole is completed so as not to obstruct flow of the existing pipe.
3. At existing manhole tie-ins, temporarily block and/or divert sewage flows, provide by-pass pumping and perform other miscellaneous work.
 - a) Use high-early strength cement for mortar, forming proper channels with minimum interruption to service of the existing sewer.

H. SERVICE LATERALS

1. Service laterals shall be installed where required to provide a connection from the sanitary sewer to all lots.
2. Service laterals shall be six (6) inch diameter DIP or PVC, except as noted in Item 3 below, and conform to the requirements of these guidelines. A service wye shall be installed at the end of each service lateral and plugged in a manner to allow for air testing. The depth of a service shall be a minimum of 36" below finished grade, and a maximum of 60".
3. All individual sewer services shall have 4" diameter Elder Valves and approved PVC reducers installed during construction. The shut-off valve access pipe for the Elder Valve shall be cut off to match finished grade and capped as indicated on the District's Standard service Connection detail
4. All services shall be supplied with a concrete collar.
5. Service laterals shall be connected at manholes whenever possible and installed so the crown of the sewer exiting the manhole and the service lateral are the same elevation (match crowns) unless approved otherwise by the District.
6. Connect to street sewers using wye branches and ells.
7. Do not stack service lines vertically over the sewer main.
8. Comply with details in the Details Section.
9. Locate service lateral within one (1) foot off-set from property corner on opposite corner of water service meter unless approved otherwise by the District.
10. Minimum cover required by SCDOT and the District of service lateral is 36". SCDOT and the District may require concrete encasement under drainage ditch on an individual review.

I. INSPECTIONS AND TESTING

1. General:

- a. The District will require that all sanitary sewer systems pass the following test prior to acceptance: (District shall be notified 48 hours before inspections).

2. Air Testing:

The Contractor shall conduct low pressure air tests on all completed sections of gravity sewer in accordance with ASTM F-1417.L.R., for all PVC pipe. The air test results will be used to evaluate construction methods on the sewer line sections.

The Contractor shall furnish an air compressor which will provide at least 300 cubic feet of air per minute at 100 psi, air hose, connection and other equipment necessary to conduct the air tests. Plugs in sewers 18" in size and larger shall be connected by cable for thrust reaction. The following provisions will be adhered to when conducting low pressure air tests:

3. Equipment

a. Plug Design

Either mechanical or pneumatic plugs may be used. All plugs shall be designed to resist internal testing pressures without the aid of external bracing or blocking. However, the Contractor should internally restrain or externally brace the plugs to the manhole wall as an added safety precaution throughout the test.

b. Singular Control

To facilitate test verification by the inspecting Engineer, all air used shall pass through a single, above ground control panel.

c. Equipment Controls

The above ground air control equipment shall include a shut-off valve, pressure regulating valve, input pressure gauge, and a continuous monitoring pressure gauge having a pressure range from 0 to at least 10 psi. The continuous monitoring gauge shall be no less than 4" in diameter with minimum divisions of 0.10 psi and an accuracy of ± 0.04 psi.

d. Separate Hoses

Two separate hoses shall be used to: (1) connect the control panel to the sealed line for introducing low pressure air, and (2) a separate hose connection for constant monitoring of air pressure build-up in the line. This requirement greatly diminishes any chance for over-pressurizing the line.

e. Pneumatic Plugs

If pneumatic plugs are utilized, a separate hose shall also be required to inflate the pneumatic plugs from the above ground control panel.

4. Line Preparation

a. Laterals, Stubs, and Fittings

During sewer construction all service laterals, stubs, and fittings into the sewer test section shall be properly capped or plugged so as not to allow for air loss that could cause an erroneous air test result. It may be necessary and is always advisable to restrain gasketed caps, plugs, or short pipe lengths with bracing stakes, clamps and tie-rods, or wire harnesses over the pipe bells.

5. Test Procedure

a. Plug Installation and Testing

After a manhole to manhole reach of pipe has been backfilled to final grade, prepared for testing, and the specified waiting period has elapsed, the plugs shall be placed in the line at each manhole and secured.

It is advisable to seal test all plugs before use. Seal testing may be accomplished by laying one length of pipe on the ground and sealing it at both ends with the plugs to be checked. The sealed pipe should be pressurized to 9 psig. The plugs should hold against this pressure without bracing and without any movement of the plugs out of the pipe.

No persons shall be allowed in the alignment of the pipe during plug testing.

It is advisable to plug the upstream end of the line first to prevent any upstream water from collecting in the test line. This is particularly important in high groundwater situations.

When plugs are being placed, the pipe adjacent to the manhole shall be visually inspected to detect any evidence of shear in the pipe due to differential settlement between the pipe and the manhole. A probable point of leakage is at the junction of the manhole and the pipe, and this fault may be covered by the pipe plug, and thus not revealed by the air test.

b. Line Pressurization

Low pressure air shall be slowly introduced into the sealed line until the internal air pressure reaches 4.0 psig greater than the average back pressure of any groundwater above the pipe, but not greater than 9.0 psig. Immediately before testing, if groundwater is present, the groundwater elevation must be determined by appropriate means.

c. Pressure Stabilization

After a constant pressure of 4.0 psig (greater than the average groundwater back pressures), is reached, the air supply shall be throttled to maintain that internal pressure for at least 2 minutes. This time permits the temperature of the entering air to equalize with the temperature of the pipe walls.

d. Timing Pressure Loss

When temperatures have been equalized and the pressure stabilized at 4.0 psig (greater than the average groundwater back pressure), the air hose from the control panel to the air supply shall be shut off or disconnected. The continuous monitoring pressure gauge shall then be observed while the pressure is decreased to no less than 3.5 psig (greater than the average back pressure of any groundwater over the pipe). At a reading of 3.5 psig, or any convenient observed pressure reading between 3.5 psig and 4.0 psig (greater than the average groundwater back pressure), timing shall commence with a stop watch or other timing device that is at least 99.8% accurate.

A predetermined required time for a specified pressure drop shall be used to determine the lines acceptability. Traditionally, a pressure drop of 1.0 psig has been specified. However, other pressure drop values may be specified, provided that the required holding times are adjusted accordingly. If the specified pressure drop is 0.5 psig rather than the more traditional 1.0 psig, then the required test times for a 1.0 psig pressure must be halved. Specifying a 0.5 psig pressure drop is desirable in that it can reduce the time needed to accomplish the air test without sacrificing test integrity. Therefore, the following subsections contain provisions for both the traditional 1.0 psig

pressure drop and the more efficient 0.5 psig pressure drop. All requirements for a specified 0.5 psig drop are given in parentheses.

e. Determination of Line Passing

If the time shown in Table I (or Table II), for the designated pipe size and length, elapses before the air pressure drops 1.0 psig (or 0.5 psig); the section undergoing test shall have passed and shall be presumed to be free of defects. The test may be discontinued once the prescribed time has elapsed even though the 1.0 psig (or 0.5 psig) drop has not occurred.

f. Determination of Line Failure

If the pressure drops 1.0 psig (or 0.5 psig) before the appropriate time shown in Table I (or Table II) have elapsed, the air loss rate shall be considered excessive and the section of pipe has failed the test.

g. Line Repair or Replacement

If the section fails to meet these requirements, the Contractor shall determine at his own expense the source, or sources of leakage, and he shall repair or replace all defective materials and/or workmanship to the satisfaction of the District. The extent and type of repair which may be allowed, as well as results, shall be subject to the approval of District. The completed pipe installation shall then be retested and required to meet the requirements of the test.

h. Specified Time Tables

To facilitate the proper use of this recommended practice for air testing, the following tables are provided. Table I contains the specified minimum times required for a 1.0 psig pressure drop from a starting pressure of at least 3.5 psig greater than the average back pressure of any groundwater above the pipe's invert. Table II contains specified minimum times required for a 0.5 psig pressure drop from a starting pressure of at least 3.5 psig greater than the average back pressure of any groundwater above the pipe's invert. Both Tables also include easy to use formulas for calculating required test times for various pipe sizes and odd lengths.

i. Vacuum Testing for Precast Concrete Manholes

All new manholes shall be vacuum tested in accordance with ASTM C1244, L.R. Test procedures shall be coordinated with and approved by the District prior to testing mobilization.

6. Pipe Deflection

After backfilling trenches PVC sewer pipe shall be tested for initial diametric deflections by the use of a 5% mandrel which is acceptable to the District. The initial diametric deflection shall not exceed 5%. The mandrel pull shall be as described in the Ten States Standards. The Contractor shall not use any mechanical device in the Mandrel pull.

All PVC gravity sewer pipe, 8" diameter and larger, shall be tested after installation and backfill by the Contractor. Testing shall be performed at the Contractor's expense using a 5% mandrel acceptable to the District to insure that initial deflection of pipe does not exceed 5%. All deflection testing shall be performed in the presence of the Engineer and District. Contractor shall notify the Engineer and the District in sufficient time to insure that the both will be present during deflection tests. Deflection test records shall identify the location and deflection amount at all points where deflection exceeds the specified limit. Such records shall be certified by the Contractor, and shall be furnished to the Engineer prior to acceptance and payment. Pipe with initial deflection exceeding the specified limit will be unacceptable, and shall be re-bedded to the correct deflection and retested for deflection, at the Contractor's expense.

7. Visual Inspection

All gravity sewer manholes and pipelines shall be visually inspected by the District's Inspector prior to acceptance. Gravity sewer manhole castings shall be set to final grade and in accordance with applicable roadway encroachment permit conditions, have no visible infiltration, contain properly formed and sloped inverts, and be properly coated and externally joint wrapped as specified elsewhere. Gravity sewer pipelines shall be of uniform slope with no portion holding water. Repairs to gravity sewer pipelines shall be performed in manner equivalent to new construction. Fernco style couplings or repair bands shall not be used.

8. Video Inspection

- a. The District will require the Developer to perform a CCTV interior video inspection of all lines at the Developer's expense. Two copies on CD's will be required for review.
- b. The Developer may elect to hire the District to perform the video inspection at a rate defined in the District's latest Use and Rate Ordinance.

9. At the discretion of the District, and in addition to air testing, pipe deflection test, and visual inspection, the District may require the following:

a. Leaking and Infiltration

All pipe joints shall be watertight. Infiltration of groundwater or other leakage into the sewer (including manholes) shall not exceed 200 gallons per inch of pipe diameter per mile per day in any section of the completed work.

- b. The infiltration rate into each section of the sewer shall be measured by the temporary installation of suitable metal or wooden weirs as authorized by the District. These weirs shall be furnished, installed, and removed by the Contractor. Any leaks into the sewer shall be located, repaired and corrected at the Contractor's expense.

10. Soil Compaction Requirements and Warranty Repairs

- a. All trenches suspected of not meeting the compaction requirements stated previously shall be tested at the Developer's expense for conformance by a District approved testing lab and at the locations and depths requested by the District.
- b. During the District's warranty period, the Developer shall be required, when notified, to make prompt repairs to both paved and unpaved surfaces disturbed by construction activities. Such repairs shall include, but not be limited to: regrading, soil compaction, grassing/sodding repairs, driveway, curb and sidewalk repairs, and drainage facility repairs caused by wastewater construction activities.

Table I

Specification time required for a 1.0 psig pressure drop for size and length of pipe indicated for $Q=0.0015$

1 Pipe Diameter (in)	2 Minimum Time (min:sec)	3 Length for Minimum Time (ft)	4 Time for Longer Length (sec)	Specification Time for Length (L) Shown (min:sec)							
				100 ft	150 ft	200 ft	250 ft	300 ft	350 ft	400 ft	450 ft
4	4:00	597	0.380L	4:00	4:00	4:00	4:00	4:00	4:00	4:00	4:00
6	5:40	398	0.854L	5:40	5:40	5:40	5:40	5:40	5:40	5:42	6:24
8	7:34	298	1.520L	7:34	7:34	7:34	7:34	7:36	8:52	10:08	11:24
10	9:26	239	2.374L	9:26	9:26	9:26	9:53	11:52	13:51	15:49	17:48
12	11:20	199	3.418L	11:20	11:20	11:24	14:15	17:05	19:56	22:47	25:38
15	14:10	159	5.342L	14:10	14:10	17:48	22:15	26:42	31:09	35:36	40:04
18	17:00	133	7.692L	17:00	19:13	25:38	32:03	38:27	44:52	51:16	57:41

21	19:50	114	10.470L	19:50	26:10	34:54	43:37	52:21	61:00	59:48	78:31
24	22:40	99	13.674L	22:47	34:11	45:34	56:58	68:32	79:46	91:10	102:33
27	25:30	88	17.306L	28:51	43:16	57:41	72:07	86:32	100:57	115:22	129:48
30	28:20	80	21.366L	35:37	53:25	71:13	89:02	106:50	124:38	142:26	160:15
33	31:10	72	25.852L	43:05	64:38	86:10	107:43	129:16	150:43	172:21	193:53
36	34:00	66	30.768L	51:17	76:55	102:34	128:12	153:50	179:29	205:07	230:46

Table II

Specification time required for a 0.5 psig pressure drop for size and length of pipe indicated for Q=0.0015

1 Pipe Diameter (in)	2 Minimum Time (min:sec)	3 Length for Minimum Time (ft)	4 Time for Longer Length (sec)	Specification Time for Length (L) Shown (min:sec)							
				100 ft	150 ft	200 ft	250 ft	300 ft	350 ft	400 ft	450 ft
4	4:00	597	0.190L	4:00	4:00	4:00	4:00	4:00	4:00	4:00	4:00
6	4:00	398	0.427L	4:00	4:00	4:00	4:00	4:00	4:00	4:00	4:00
8	4:00	298	0.760L	4:00	4:00	4:00	4:00	4:00	4:26	5:04	5:42
10	4:43	239	1.187L	4:43	4:43	4:43	4:57	5:56	6:55	7:54	8:54
12	5:40	199	1.709L	5:40	5:40	5:42	7:08	8:33	9:58	11:24	12:50
15	7:05	159	2.671L	7:05	7:05	8:54	11:08	13:21	15:35	17:48	20:02
18	8:30	133	3.846L	8:30	9:37	12:49	16:01	19:14	22:26	25:38	28:51
21	9:55	114	5.235L	9:55	13:05	17:27	21:49	26:11	30:32	34:54	39:16
24	11:20	99	6.837L	11:24	17:57	22:48	28:30	34:11	39:53	45:35	51:17
27	12:45	88	8.653L	14:25	21:38	28:51	36:04	43:16	50:30	57:43	46:54
30	14:10	80	10.683L	17:48	26:43	35:37	44:31	53:25	62:19	71:13	80:07
33	15:35	72	12.926L	21:33	32:19	43:56	53:52	64:38	75:24	86:10	96:57
36	17:00	66	15.384L	25:39	38:28	51:17	64:06	76:55	89:44	102:34	115:23

J. GENERAL

1. Wyes and Tees

- a. Wye and tee branches shall be installed in sanitary sewer lines as required. If such branches are not to be used immediately they shall be capped as specified by manufacturer for the sewer pipe.
- b. If the work consists of the construction of a sewer that is to replace an existing sewer all of the existing service lines shall be connected to the new line by a method approved by the District prior to construction.

- c. Wyes and tees shall be installed in sanitary sewers so as to properly serve each existing house and each vacant lot facing or abutting on the street or alley in which the sewer is being laid, and at such other locations as may be designated by District. The exact location of each connection shall be determined by the Engineer before backfilling.
- d. Wyes and tees shall be of the same material and pressure class/rating as the sewers on which they are installed.

2. Service Laterals

- a. Service laterals shall be installed where required to provide a connection from the sanitary sewer to all existing and/or new separate buildable lots. In no case shall the clean-out be placed within 15 feet of structures being served.
- b. Service laterals shall **consists of 6" diameter DIP or PVC and conform to the requirements of these guidelines. A service wye shall be installed at the end of each service lateral and plugged in a manner to allow for air testing. The depth of a service shall be a minimum of 36" below finished grade, and a maximum of 60".** Service laterals that exceed 75' in length shall be reviewed on an individual basis with the District. Elder cut-off valves shall be installed on all individual service lines pursuant to subsection H3 above.

3. Connections to Existing Sewers

- a. Connections to existing manholes shall be made in the presence of the District Inspector. The Contractor shall notify the District 48 hours before starting a connection. All new holes in existing manholes shall be core drilled.

4. Pipe Protection

- a. Sewer pipe which, when completed, will have less than 3' of cover shall be constructed of ductile iron pipe.
- b. Where foundation conditions are not satisfactory as determined by the soil conditions, sewer pipe shall be either laid on a Class B concrete cradle, pipe foundation material, or constructed of ductile iron pipe, as approved in advance by District.
- c. Where sewer pipe is laid under storm drainage pipe, there must be a minimum of 18" of separation or more. If unable to obtain 18" of clearance, use concrete encasement centered under the drainage line.

5. Pipe storage and handling shall be in accordance with the pipe manufacturer's requirements and DIP lining material requirements published where applicable. Pipe shall be stored on a smooth surface to avoid point loadings. Pipe shall be handled as required to prevent damage to the pipe and lining. Correct equipment should be used to load or unload pipe so as to eliminate dropping, etc.
6. All excavated areas, backfills, embankments, trenches and access roads, grading and ditches shall be maintained by the Contractor in good condition at all times until final acceptance by the District. Where trench backfill has settled, trenches shall be brought back to grade.

K. TRENCH EXCAVATION

This section of the guidelines is provided to outline most types of laying conditions, but is not intended to cover all special laying conditions or the Engineer's special requirements.

1. Trench excavation shall be made in open cut and true to the lines and grades shown on the plans, unless boring is necessary or required. Banks of the trenches shall be cut in vertical, parallel planes equidistant from the pipe center line. The horizontal distance between such planes, or the overall width of trench, shall vary with the size of the pipe to be installed. The overall width of trench shall be as indicated on applicable JIPSD Trench Section Detail Drawings. When vertical banks for trench excavation are not practical to construct or create dangerous conditions to workmen, the banks may be sloped provided that such excavation does not damage adjacent structures. When trench banks are sloped, such banks shall be cut to vertical planes as specified above for that part of the ditch below the level of 12" above the top of the pipeline. The bottom of the trench shall be level in cross section and shall be cut true to the required grade of the pipe and pipe embedment materials.
2. Bell holes for bell-and-spigot pipe shall be excavated at proper intervals so that the barrel of the pipe will rest for its entire length upon the bottom of the trench. Bell holes shall be large enough to permit proper installation of joints in the pipe.
3. When muck, quicksand, soft clay, organics or other material unsuitable for foundations or sub-grade are encountered such material shall be removed and replaced with SCDOT No. 57 aggregate as specified elsewhere.
4. Remove all water, including rain water, encountered during trench excavation to an approved location by pumps, drains, and other approved methods. Keep trenches and site construction area free from water.

5. After excavation, the area between the final pipe grade and the trench soil bottom shall be back-filled with specified aggregate bedding materials as required, compacted to proper grade, and made ready for pipe laying.
6. Debris encountered in trench excavation for sewers and other pipelines shall be removed for the overall width of trench which shall be as shown on the plans. It shall be removed to a depth of 6" below the bottom of the pipe for pipes smaller than 24" in size; 8" below the bottom of the pipe for pipes 24" to 36" in size; and 12" below the bottom of the pipe for pipes larger than 36" in size, if debris extends to such depth.
7. In all cases, materials deposited shall be placed so that in the event of rain, no damage will result to the work or create silted runoff into downstream drainage facilities.
8. The sides of all excavations shall be sheeted, shored and braced pursuant to applicable OSHA requirements to prevent slides, cave-ins, settlements or movement of the trench banks and to maintain the excavation clear of obstructions. Wood or steel sheet piling of appropriate design and type shall be of sufficient strength and rigidity to withstand the pressures exerted and to maintain the walls of the excavation properly in place and protect all persons and property from injury or damage. Sheeting, shoring or bracing materials shall not be left in place unless as shown by the plans or permitted by the District. All trench sheeting and bracing shall be left in place until the trench has been backfilled one foot above the top of the pipe.
9. All excavation work shall comply with applicable OSHA requirements for trenching and structure excavations.

L. TRENCH BACKFILL

1. The backfilling of pipeline trenches shall be started immediately after the pipe work has been installed. The initial backfill material, placed to a height of one (1) foot above the top of the pipe, shall consist of approved backfill material free from organic matter and deleterious substances, containing no rocks or lumps over 2" in any dimension.

It shall be carefully placed and compacted through compaction of the entire area backfilled.

Backfill shall be deposited in 6" layers (before compaction) and thoroughly compacted with power tools to 95% of theoretical maximum density, modified Proctor ASTM-D-1557. Compaction test results shall be provided to the District within 40 hours after testing. No final grading or paving shall be allowed until satisfactory test results are available and provided to the District.

One compaction test shall be provided for every 300 linear feet of trench per compacted lift of backfill.

2. Where trenches are not under pavement, sidewalks, or in alleys, the backfill material above pipe zone shall be compacted to a sufficient density to prevent settlement. Any deficiency in backfilling the trenches, or depressions caused by settlement, shall be repaired.
3. Where pipe trenches are cut across or along pavement, trenches shall be backfilled with select fill material placed and compacted in 6" lifts. Replacement of Controlled Density Fill (CDF), base materials and asphalt surface course shall be in accordance with South Carolina District of Transportation (SCDOT) regulations and the general and special conditions contained in encroachment permits issued for the work.
4. Backfilling around structures shall be done in the manner specified above for pipe trenches by power tamping for the full depth of cut from the bottom of the finished grade.
5. All backfilling shall be done in such a manner as will not disturb or injure the pipe or structure over or against which it is being placed. Any pipe or structure injured, damaged or moved from its proper line or grade during backfilling operations shall be uncovered, repaired, and then re-backfilled as herein specified.

M. INSTALLATION OF CASING, SPACERS, AND END SEALS

1. Locate to avoid interference with traffic, adjacent structures, etc. to such extent possible.
2. Excavate to required depth, providing sheeting and shoring necessary for protection of the work and for safety of personnel.
3. Maintain entry pits in dry condition by use of pumps, drains or other approved method.
4. Install casings by dry-boring through the casing while simultaneously jacking the casing.
5. Any proposed alternate method shall be approved in writing by District.
6. Weld joints to provide a watertight joint.
7. Install casings for gravity sanitary sewer to grade, not varying more than 3/32" per foot of length from the indicated grade.

8. Installing pipe in casing:
 - a. Inspect carefully, insuring that all foreign material is removed from the casing and the casing meets alignment criteria for the type of carrier pipe being used.
 - b. Install casing spacers on the carrier pipe per the manufacturer's instructions.
 - c. For sanitary sewer provide spacer sizing and length necessary to obtain the pipe slope and elevations as shown on the plans.
 - d. Provide restrained configuration.
 - e. Install the carrier pipe in the casing insuring each joint is pushed "home" before the joint is installed into the casing.

9. End seals:
 - a. Provide 1/8" thick rubber end seal to seal each end of the casing.
 - b. Secure to casing and carrier pipe with T-304 stainless steel bands.
 - c. Acceptable manufacturers: Cascade Manufacturing, Pipeline Seal and Insulator, Inc. or approved equal.
 - d. Brick and mortar end seals shall be allowed only with District prior approval.

8.

FORCE MAIN DESIGN STANDARDS

SECTION 8

WASTEWATERFORCE MAIN

DESIGN STANDARDS

A. GENERAL

1. The following force main system design guidelines are based on Federal, State and local health requirements and the District engineering design criteria.
2. These design guidelines are applicable to all developments including, but not limited to, residential, commercial and industrial developments, subdivisions and/or parks requiring sewer service from the District.

B. FORCE MAIN DESIGN CRITERIA

1. Minimum pipe size: 4", unless for LPSS systems.
2. Design velocity.
 - a. Minimum: 2.5 feet per second.
3. Maximum pipe size:
 - a. Force main diameter shall maintain a minimum 2.5 feet per second velocity at the approved pump operating duty point.

C. AIR RELEASE VALVES (ARV)

1. Provide at all high points in the force main.
2. Design force main to minimize the number of air release valves.
3. Provide tapping saddles and lever operated ball check valves to allow ARV removal.
4. ARV structures shall be constructed in accordance with applicable standard District detail drawings.
- .5. All ARV Structures shall be lined as specified in subsection 7.F.

D. PLUG VALVES

1. For force mains greater than 3,000 feet in length, provide a plug valve at the half way point, and/or at 2,000 feet intervals, or as required by the District.

2. Where a force main is tying into an existing force main:
 - a. Provide one (1) plug valve at the tie-in location to isolate the lateral force mains connecting into existing, primary force mains.
3. All plug valves 8" in diameter and larger shall be gear operated.
4. See Section 12 for valve specifications.

E. FORCE MAINS ENTERING MANHOLES

1. No more than two (2) feet, vertically, above the receiving manhole's flowline.
2. Line interior of Force Main junction manhole interior per Section 7. Unless approved otherwise, also line the next three (3) new and/or existing downstream manholes.
3. The District reserves the right to require a manhole vent where force mains are entering manholes.
4. Where discharge rates exceed 300 GPM, the District may require a special discharge structure designed and constructed pursuant to District requirements.
5. Discharge rates from proposed new pump station force mains discharging into existing sewers shall not exceed 50% of the full flow rate of the receiving sewer unless specifically approved by the District.

F. SEPARATION OF FORCE MAINS AND WATER MAINS

1. Locate force main separation at least ten (10) feet pipe-to-pipe, horizontally, from water mains.
2. Should ten (10) foot separation not be practical, and approved by the Wastewater Superintendent, then the force main may be located closer provided the three (3) following conditions are met:
 - a. It is constructed in a separate trench.
 - b. It is constructed in the same trench with the water main located at one side on a bench of undisturbed earth.
 - c. In either of the above cases, the force main shall be at least 18" pipe-to-pipe separation below the bottom elevation of water main.
3. Where force mains cross under water lines, maintain 18" minimum vertical pipe-to-pipe separation between the two pipes.

- a. Use full length of force main pipe located so that the joints will be equal distance from the water main.

G. COVER

- 1. Provide suitable cover on all wastewater force mains. Minimal cover depth as follows:
 - a. 4" and larger: 36".
- 2. All force mains located within the right-of-way of the South Carolina Department of Transportation shall have a minimum cover of 48" below the crown of the road when installed within the limits of the paved roadway, 36" cover when installed in the shoulder of right-of-way and a minimum of 18" separation under the design invert of drainage structures. The greater dimension of the above shall dictate minimum depth where applicable.
- 3. Force mains shall be installed consistent with SCDOT "Utility Accommodation Manual" requirements.
- 4. Special conditions other than those listed above may be approved if requested in writing from the District.

H. DUCTILE IRON PIPE LOCATIONS

- 1. Use Ductile Iron Pipe for the following:
 - a. Ductile Iron Pipe for force mains shall be of the pressure classes specified in section 6.B.2.a and manufactured in accordance with ASTM A-377, L.R.
 - b. Where force mains cross over water mains, the force main shall transition to ductile iron pipe. A full length of ductile iron pipe shall be installed in the force main centered so that each joint is equidistant from the water main. Joint of ductile iron pipe water main shall also be installed so that each joint is equidistant from the ductile iron pipe section of the sewer main.
 - c. Crosses beneath storm drainage pipe with less than three (3) feet of pipe-to-pipe clearance.
 - d. Crosses above storm drainage pipe with less than 18" of pipe-to-pipe clearance.
 - e. Cover is less than the depth prescribed in Part G above.

- f. Provide polyethylene encasement of all DI Pipe pipe and DI fittings. Minimum nominal thicknesses of 8 mils conform to AWWA C105.
- g. The District reserves the right to require either Low DR (thick wall) C900/C905 PVC in lieu of ductile iron pipe where aggressive soil conditions or high H₂S concentration wastewater conditions exist.

9.

**FORCE MAIN
MATERIALS FOR CONSTRUCTION**

SECTION 9

FORCE MAIN

MATERIALS FOR CONSTRUCTION

A. GENERAL

1. Unless otherwise noted or approved by the District all materials shall be manufactured in the United States. (American Iron and Steel Act compliant)
2. Ductile Iron Pipe shall be installed only where required and as specifically specified elsewhere herein or where directed by the District. Otherwise, AWWA C900/C905 PVC pipe shall be the default material required.

B. PIPE AND FITTINGS

1. Ductile-iron pipe and fittings (DIP):
 - a. 4" - 12" pressure class 350.
 - b. 14" - 20" pressure class 250.
 - c. Flanged pipe shall be class 53 (minimum).
 - d. Use mechanical Restrained "Megaling" or equal ANSI/AWWA C111/A21.11 as modified by ANSI/AWWA C151/A21.51 with 316/304 SS bolts and nuts, respectively.
 - e. Use rubber gaskets and lubricant: ANSI/AWWA C111/A21.11.
 - f. Use fittings with pressure rating of 150 psi: ANSI/AWWA C110/A21.10 or C153/A21.53.88.b.
 - g. Lining:
 - 1) Amine cured Novalac Epoxy polymeric lining, 40 mils nominal thickness. Protecto 401 by Vulcan Painters, Birmingham, Alabama 40 mils nominal thickness, Permax CTF 40 mils normal thickness, or approved equal polyethylene lining.
 - h. All DIP force main and house sewer installations shall also include the installation of an electronically or magnetically detectable safety tape buried directly over the pipe 12" below the ground surface continuously. The tape shall be at least 2" wide, green in color, and boldly labeled every 18" to 32" as follows "CAUTION SEWER LINE

BURIED BELOW". The tape shall have a tensile strength of not less than 4000 psi, a dart impact strength of not less than 120 grams per 1.5 mils, be not less than 0.0055" thick, and include sufficient metal to allow easy detection at the above stated depths. The tape shall have a serviceable functional life equal to or exceeding the pipe over which it is installed, , irrespective of adverse soil conditions.

- i. All DIP force main shall also include the installation of a continuous metallic tracer wire laid 6" above the pipe.
 - j. Provide polyethylene encasement of all Ductile Iron Pipe and Ductile Iron fittings. Minimum nominal thicknesses of 8 mils conform to AWWA C105.
 - k. DIP force main shall only be used as indicated in Section 8 Part H or as required by the District.
2. Polyvinyl chloride pipe and fittings (PVC):
- a. Gaskets to comply with ASTM F477.
 - 1) Natural rubber gaskets are not acceptable.
 - b. 4" - 12":
 - 1) Comply with ANSI/AWWA C900, Table 2, Pressure Class 150, DR18 minimum thickness DIOD unless approved otherwise by the District.
 - c. 14" and larger:
 - 1) Comply with ANSI/AWWA C905 Table 2, pressure class 165, DR18 minimum thickness DIOD unless approved otherwise by the District.
 - d. Plastic pipe 3" and smaller:
 - 1) Comply with ASTM D2241 for PVC 1120, SDR 26.
 - e. Use integral bell or coupling type with elastomeric gaskets.
 - f. Factory-install gaskets integral with the pipe.
 - g. Use ductile iron fittings with pressure rating of 150 psi: ANSI/AWWA C110/A21.10 or C153/A21.53.88.b.

- 1) Lining per Part B.1.h. above.
 - h. Provide adaptor glands, gaskets, etc. as required to accommodate any differences in pipe and fitting dimensions.
 - i. Couplings:
 - 1) Ductile iron, pressure class 350, full length.
 - j. All PVC force main installations shall also include the installation of an electronically or magnetically detectable safety tape buried directly over the pipe 12" below the ground surface continuously. The tape shall be at least 2" wide, green in color, and boldly labeled every 18" to 32" as follows "CAUTION SEWER LINE BURIED BELOW". The tape shall have a tensile strength of not less than 4000 psi, a dart impact strength of not less than 120 grams per 1.5 mils, be not less than 0.0055" thick, and include sufficient metal to allow easy detection at the above stated depths. The tape shall have a serviceable, functional life equal to or exceeding the pipe over which it is installed, irrespective of adverse soil conditions.
 - k. All PVC force main installations shall also include the installation of a continuous metallic tracer wire laid 6" above the pipe or attached to the pipe.
3. High Density Polyethylene (HDPE) Pipe:
- a. High Density Polyethylene (HDPE) pipe shall be allowed for horizontal directional drilling (HDD) within roadway rights-of-way or wetland and waterway crossings. All other uses of HDPE pipe shall be approved by the District.
 - b. Comply with AWWA C-906, DR 11, DIOD, and minimum working pressure of 160 psi for all HDPE 4" nominal diameter and larger.
 - 1) Smaller diameter HDPE pipe utilized for AWCS (Grinder Pump) force mains shall be IPS for compatibility with District approved AWCS fittings.
 - c. Specifications
 - 1) All Standard Specifications, i.e., Federal, ANSI, ASTM, etc. made a portion of these Specifications by reference, shall be the latest edition and revision thereof.
 - 2) All polyethylene (HDPE) pipe furnished under these Specifications shall conform to all applicable requirements in

the latest revision of the following standards, unless otherwise specified herein:

ASTM D-1248	Specification for Polyethylene Molding and Extrusion Materials
ASTM D-3350	Polyethylene Plastics (PE) Pipe and Fittings Materials
ASTM D-1693	Environmental Stress-Cracking of Ethylene Plastics
ASTM F-714	Polyethylene Plastic Pipe (SDR-PR) Based on Outside Diameter

- 3) All pipe resin shall be manufactured by the same company that manufactures the pipe itself in accordance with these specifications to insure complete resin compatibility and total product accountability.
- 4) HDPE electrofusion weld fittings supplied pursuant to specification requirements stated above shall be molded or manufactured from a polyethylene compound having a cell classification equal to or exceeding the compound used in the pipe. To insure compatibility of polyethylene resins, all fittings supplied under this specification shall be of the same manufacture as the pipe being supplied.

d. Materials:

- 1) Materials used for the manufacturer of polyethylene pipe and fittings shall be high performance, high molecular weight, high density polyethylene pipe equal to Driscopipe 1000, as manufactured by Phillios Driscopipe Company, Inc., or Plexco PE 3408, as manufactured by Chevron Plexco Company, Inc. or approved equal product meeting the following requirements:

<u>Property</u>	<u>Unit</u>	<u>Test Procedure</u>	<u>Typical Value</u>
Material Classification	B	D-1248	B
Cell Classification	B	D-3350	345434C
Density	gm/cm ³	D-1505	0.955
Melt Flow	gm/10 min.	D-1238	0.1

Flexural Modulus	psi	D-790	133,000
Tensile Strength	psi	D-638	3,500
ESCR	Failure % Hours	D-1693	F _a >5,000
HDB	psi	D-2837	1,600
UV Stabilizer	Carbon Black	D-1603	2 to 3
Elastic Modulus	psi	D-638	100,000
Brittleness Temperature	° F	D-746	-180
Vicat Softening Temperature	° F	D-1525	255
Thermal Expansion	in/in/°F	D-696	8 x 10 ⁻⁵
Hardness	Shore D	D-2240	64
Molecular Weight Category	B	B	Extra High
Molecular Weight	B	GPC ¹	>250,000
HDB @ 73.4°F	psi	D-2837	1,600
HDB @ 140°F	psi	D-2837	800

¹GPC = Gel Permeation Chromatography

- 2) All testing material compliance shall be as specified herein and pursuant to applicable test procedures tabulated above. A certificate of compliance and report of each test shall be furnished by the manufacturer for all materials furnished. Pipe and fittings shall be rejected for failure to meet requirements specified herein.

e. Pipe and Fittings:

1. Pipe and fittings shall be manufactured from identical material meeting the requirements of Subsection d above. The manufacturer shall certify that samples of production pipe have been tested in-house in accordance with ASTM D-2837 and confirm to the latest revision of Plastic Pipe

Institute (PPI) TR-3. The Contractor shall certify that all pipe material and fittings supplied for the work meet or exceed all specified requirements of Subsection d above. The minimum hydrostatic design basic shall be certified by the manufacturer to be 1,600 psi at 73.4°F and 800 psi at 140°F. The pipe and fitting manufacturer shall have an independent PPI Material Listing in accordance with PPI TR-3 and TR-4.

2. Pipe and fittings shall be pressure rated using the certified HDB data pursuant to Subsection d above. Where certified HDB test data required pursuant to Subsection d above is not available, pipe and fittings shall be rejected.
3. Pipe shall be manufactured in accordance with ASTM F-714. Dimensions and tolerances for outside diameter and minimum wall thickness shall be in accordance with Table 10, "Minimum Wall Thickness" for the DIPS Sizing Systems as specified in ASTM F-714.
4. Pipe Design: Pipe DR shall be determined in accordance with the external hydrostatic load conditions and the tensile stress conditions encountered during pull-back and shall be a minimum thickness of DR 11 or lower (thicker) unless indicated otherwise on the Drawings.

f. Quality control:

- 1) The resin used for manufacture of the pipe shall be manufactured by the pipe manufacturer to insure maximized control of pipe quality. Pipe shall not contain recycled compound except those generated in the manufacturer's own plant from resin of the same specification from the same raw material. Pipe shall be homogenous throughout, free of visible cracks, holes, foreign inclusions, or other deleterious defects and shall be identical in color, density, melt index, and other physical properties.
- 2) The polyethylene resin used shall contain all required ingredients prior to extrusion of pipe; in-plant compound blending is not acceptable.
- 3) The District may request, as part of the quality control records submittal, certification that the pipe produced is represented by the quality assurance testing. Additionally, test results from manufacturer's testing or random sampling by the Engineer that do not meet appropriate ASTM standards or manufacturer's

representation, may be cause for rejection of pipe represented by the testing. These tests may include density and flow rate measurements from samples taken at selected locations within the pipe wall and thermal stability determinations according to ASTM D 3350, 10.1.9. Certified lab data may be requested to verify the physical properties of the materials supplied under this specification or may take random samples and have them tested by an independent laboratory.

- g. All HDPE pipe shall include the installation of metallic tracer wire attached to the pipe as indicated on applicable standard District Detail Drawings.
- h. Rejection:
 - 1) The District reserves the right to reject any HDPE pipe and fittings failing to meet any of the requirements of this specification.
- i. Joints: All electrofusion joints to MJ DIP fittings shall be furnished with 316SS fasteners, backplates, and interior stiffener inserts.

C. RESTRAINED JOINT PIPE AND FITTINGS

- 1. Provide restrained joint pipe and fittings on all piping at each fitting, valve, and on the pipe joints for a minimum distance of thirty-six (36) feet minimum or three (3) pipe joints on each side of the fitting or valve for 12" piping and smaller and to a minimum distance of seventy-two (72) feet minimum or six (6) pipe joints on each side of the fitting or valve for piping over 12" as a minimum. Use the ductile iron pipe research association (DIPRA) procedure for calculating restrained joint lengths.
- 2. Provide for use with mechanical joint pipe and fittings.
- 3. Provide "MEGALUG" as manufactured by EBAA Iron Sales, Inc. of Eastland, Texas on all mj fittings.
 - a. Use Snap-Lok by Griffin Pipe, Flex Ring by American Cast Iron Pipe Company, TR-Flex by U.S. Pipe, or Super-Lock by Clow for restrained joint pipe.
 - b. Use Fast Grip gaskets by American Cast Iron Pipe Company with minimum 350 psi rating or push on pipe.
- 4. Concrete thrust blocking shall be required when directed by the District where high pipe reaction forces and marginal soil conditions are anticipated.

5. Restrained joint pipe and thrust blocking shall be indicated clearly on the Drawings. The location and length of restrained joint pipe will be clearly marked on the Drawings at all points where the direction or cross-sectional area of the pipe changes as well as at all bends, reducers, offsets, tees, wyes and valves.

D. AIR RELEASE VALVES (ARV)

1. Single body universal type with compound lever system.
2. Internal float rod and offspring shall be constructed of stainless steel.
3. Capacity: At 10 lbs. working pressure, vent not less than 25 cfm of free air. Working pressure range 0.2 – 10 Bar.
4. Provide the following:
 - a. 2" inlet and outlet.
 - b. Air Release Only 2" discharge check valve option shall be included unless specifically approved otherwise.
 - c. Quick disconnect back wash/flushing couplings.
 - d. Piping, nipples, plugs, etc.: Schedule 40, type 316 stainless steel.
5. Acceptable product: ARI Model D-025 or approved equal.
6. Use composite "short body" D-025 valves where height restricts the use of long body D-025L valves.
7. ARV Manhole:
 - a. Use manhole wall sections as indicated on District Standard Detail Drawings.
 - b. Provide manhole frame and bolted, vented cover.
 - c. Line all ARV manholes pursuant to Section 7.F.

E. CASING, SPACERS AND END SEALS FOR UTILITY ROADWAY UNDERCROSSINGS

1. General
 - a. Provide bore and jack with casing for pipes larger than 2".

- b. Casing pipe to be 2" larger in diameter than the bell of the carrier pipe.
 - 1) Casing pipe inside diameter (ID) shall be a minimum of 2" larger than the largest outside diameter (OD) of the carrier pipe (joints and couplings) for carrier pipe OD less than 6" in diameter. Where the largest OD of the carrier pipe is 6" or larger, the ID of the casing pipe shall be a minimum of 4" larger than the largest OD of the carrier pipe (joints and couplings).
 - 2) The end of casing pipe to extend a minimum of six (6) feet from the edge of pavement/back of curb.
 - 3) The top of the casing pipe shall be a minimum of four (4) feet below the crown of the finished asphalt roadway.
 - 4) The top of the casing pipe shall be a minimum of two (2) feet below the design invert of roadside drainage ditches and pipes.

2. Casing pipe for dry bores

- a. Steel complying with ASTM A139 for Grade B with minimum yield strength of 35,000 psi.
- b. Provide ends suitable for field welding.
- c. Minimum wall thickness as follows:

<u>Diameter of Casing</u> (Inches)	<u>Minimum Wall Thickness</u> (Inches)
6 thru 14	0.250
16 and 18	0.313
20 and 22	0.375
24 and 26	0.407
28 thru 32	0.500
34 thru 42	0.563
44 thru 48	0.625

3. Pipeline casing spacers:

- a. Provide pipeline casing spacers for all piping installed in casing.
- b. Provide a minimum of one spacer per ten linear feet of pipe for DIP pipe and one spacer per six linear feet of pipe for PVC pipe.
- c. Provide spacer with shell of 14 gauge Type 316 stainless steel.
- d. Provide shell liner of .090" thick PVC, 85-90 durometer.

- e. Provide 5/16" stainless steel connecting bolts and lock nuts, minimum three (3) per flange.
 - f. Runners from 2" wide ultra high molecular weight polymer with a high resistance to abrasion and a coefficient of friction of 0.11-0.13 in accordance with ASTM D-1894.
 - g. Support runners on 14 gauge reinforced Type 316 stainless steel risers welded to shell.
 - h. All metal surfaces to be fully passivated.
 - i. The diameter as measured over the runners shall exceed the pipeline bell or coupling outside diameter.
 - j. Acceptable product: Cascade Waterworks Manufacturing or approved equal.
4. End seals:
- a. Provide 1/8" thick rubber end seal to seal each end of the casing.
 - b. Secure to casing and carrier pipe with 14 gauge T-304 stainless steel bands.
 - c. Acceptable manufacturers: Cascade Waterworks Manufacturing, Pipeline Seal and Insulation, Inc., or approved equal.

10.

FORCE MAIN
CONSTRUCTION PROCEDURES

SECTION 10

FORCE MAIN

CONSTRUCTION PROCEDURES

This section covers construction procedures normally required for work. It does not cover any special construction procedures which may be encountered for abnormal conditions.

Special construction procedures are to be presented to the District by the Developer's Design Engineer.

A. HANDLING OF MATERIALS

1. Handle pipe so as to ensure delivery to the trench in sound, undamaged condition:
 - a. Carry pipe into position - do not drag.
 - b. Use pinch bars or tongs for aligning or turning the pipe only on the bare end of the pipe.
 - c. Use care not to injure DIP linings.
2. Thoroughly clean interior of pipe and accessories before lowering pipe into trench. Keep clean during layout operations by plugging or other approved method.
3. Before installation, inspect each piece of pipe and each fitting for defects:
 - a. Replace material found to be defective before or after laying with sound material meeting the specified requirements.
4. Rubber gaskets: Store in a cool dark place until just prior to time of installation.

B. PIPE CUTTING

1. Cut pipe neatly and bevel pipe end without damage to the pipe.
2. Unless otherwise recommended by the pipe manufacturer, cut pipe with mechanical cutter only.
 - a. Use wheel cutters when practicable.
 - b. Cut plastic pipe square and remove all burrs.

C. LOCATING

1. Locate force mains at least ten (10) feet away, horizontally, from water mains.
2. Should ten (10) foot separation not be practical, and approved by the Wastewater Superintendent, then the force main may be located closer provided:
 - a. It is laid in a separate trench.
 - b. It is laid in the same trench with the water main located at one side on a bench of undisturbed earth.
 - c. In either of the above cases, crown elevation of the force main shall be at least 18" below invert elevation of water line.
3. Where force mains cross over or under water lines, maintain 18" minimum clearance between outside edges of the two pipes.
 - a. Use full length of force main pipe located so that the joints will be equal distance from the water main.

D. ALIGNMENT OF PIPE

1. Pipe lines intended to be straight shall be so laid.
2. Where vertical or horizontal alignment requires deflection from straight lines or grade, do not exceed 75% of maximum deflection recommended by the pipe manufacturer.
3. If alignment requires deflection exceeding recommended limits, furnish bends to provide angular deflections within the allowable limits.

E. PLACING AND LAYING

1. General:
 - a. Lower pipe and accessories into trench by means of derrick, ropes, belt slings, or other equipment approved by the manufacturer.
 - b. Do not dump or drop any of the materials into the trench.
 - c. Except where necessary in making connections to other lines, lay pipe with the bells facing in the direction of laying.

- d. Rest the full length of each section of pipe solidly on the pipe bed, with recesses excavated to accommodate bells, couplings, and joints.
 - e. Remove and relay pipe that has the grade or joint disturbed after laying.
 - f. Do not lay pipe in water, or when trench conditions are unsuitable for the work; keep water out of the trench until jointing is completed.
 - g. Securely close open ends of pipe, fittings, and valves when work is not in progress.
 - h. Replace DIP pipe and fittings where any part of lining is damaged.
 - i. Lay pipe to the grades indicated on the plans. Avoid unplanned high points in the force main. Unplanned high points shall require placement of an Air Release Valve and structure at the Contractor's expense.
 - j. After each line of pipe has been laid, it shall be carefully inspected and all earth, trash, rags, and other foreign matter removed from the interior.
 - k. Each joint shall be laid so that it will form a close concentric joint with adjoining pipe and so as to avoid sudden offsets.
 - l. All jointing of pipe and fittings shall be in accordance with the pipe manufacturer's recommendations.
2. Ductile Iron Pipe and Fittings:
- a. Restrained Mechanical and push-on joints, install in accordance with ANSI/AWWA C600. See Section 9-5, subsection C.1 for minimum lengths of restrained MJ pipe each side of fittings and valves.
 - b. Gaskets: Handle, lubricate where necessary and install in strict accordance with manufacturer's recommendations.
3. PVC Pipe:
- a. Install in accordance with ASTM D-2321, latest revision.
 - b. Clean gasket, bell or coupling interior, especially groove area.
 - c. Lubricate gasket as recommended by manufacturer.

- d. Align spigot to bell, insert spigot into bell until it contacts gasket uniformly.
 - e. Use manufactures' approved leverage bar to bell pipe.
 - 1) Home line is to be clearly visible when pipe is joined.
4. Restrained joints:
- a. Install in accordance with manufacturer's instructions.
 - b. Tighten set screws to the manufacturer's rated torque using a torque wrench.
 - 1) If twist-off nuts are provided, tighten screws until nut breaks loose.

F. INSTALLATION OF AIR RELEASE VALVES

- 1. Compact backfill thoroughly over pressure sewer.
- 2. Install gravel drainage bed.
- 3. Set valve plumb, use a 316 stainless steel nipple between pressure sewer and valve.
- 4. Install manhole wall sections plumb and level.
- 5. See Standard Detail Drawing for specific requirements.

G. INSPECTIONS AND TESTING

- 1. General:
 - a. The District will require that all force mains pass the following test prior to acceptance: (the District shall be notified 72 hours before inspections).
 - b. Soil Compaction Test

All trenches suspected of not meeting the compaction requirements stated previously shall be tested for conformance by a District approved testing lab and at the locations and depths requested by the District.

c. Pressure Test

All force mains shall successfully pass a pressure test of one and one half times working pressure, but in no case less than 150 psi. The pressure test is to hold for two (2) hours.

The following AWWA formula of allowable pressure loss will determine if a force main is acceptable:

$$L = SD \frac{\sqrt{P}}{133200} \quad \text{where,} \quad \begin{array}{l} L = \text{Allowable Leakage in gal/hr} \\ S = \text{Length of Pipe Tested in feet} \\ D = \text{Nominal Diameter in inches} \\ P = \text{Average Test Pressure in psig} \end{array}$$

H. INSTALLATION OF ROADWAY UNDERCROSSING CASING, SPACERS, CARRIER PIPE, AND END SEALS

1. Locate to avoid interference with traffic, adjacent structures, etc. to such extent possible. Compliance with SCDOT, Charleston County, and Town of James Island Encroachment Permit Conditions, as applicable, shall be mandatory.
2. Excavate to required depth, providing sheeting and shoring necessary for protection of the work and for safety of personnel.
3. Maintain entry pits in dry condition by use of pumps, drains or other approved method.
4. Install casings by dry-boring through the casing while simultaneously jacking the casing.
5. Any proposed alternate method shall be approved in writing by the District.
6. Weld joints to provide a watertight joint.
7. Installing pipe in casing:
 - a. Inspect carefully, insuring that all foreign material is removed from the casing and the casing meets alignment criteria for the type of carrier pipe being used.
 - b. Casing deflection shall not exceed the maximum deflection recommended by the carrier pipe.

- c. Install casing spacers on the carrier pipe per the manufacturer's instructions.
 - d. Provide centered or restrained configuration.
 - e. Install the carrier pipe in the casing insuring each joint is pushed "home" before the joint is installed into the casing.
8. End seals:
- a. Provide 1/8" thick rubber end seal to seal each end of the casing.
 - b. Secure to casing and carrier pipe with T-304 stainless steel bands.
 - c. Acceptable manufacturers: Cascade Manufacturing, Pipeline Seal and Insulator, Inc. or approved equal.

I. TRENCH EXCAVATION

1. Trench excavation shall be made in open cut and true to the lines and grades shown on the plans, unless boring is necessary or required.
- a. Banks of the trenches shall be cut in vertical, parallel planes equidistant from the pipe center line. The horizontal distance between such planes, or the overall width of trench, shall vary with the size of the pipe to be installed. The overall width of trench shall be as recommended by the manufacturer.
 - b. When vertical banks for trench excavation are not practical to construct or create dangerous conditions to workmen, the banks may be sloped provided that such excavation does not damage adjacent structures.
 - c. When trench banks are sloped, such banks shall be cut to vertical planes as specified above for that part of the ditch below the level of 12" above the top of the pipeline.
 - d. The bottom of the trench shall be level in cross section and shall be cut true to the required grade of the pipe and pipe embedment materials.
2. Bell holes for bell-and-spigot pipe shall be excavated at proper intervals so that the barrel of the pipe will rest for its entire length upon the bottom of the trench. Bell holes shall be large enough to permit proper installation of joints in the pipe.

3. When muck, quicksand, soft clay, swampy or other material unsuitable for foundations or sub-grade are encountered such material shall be removed and replaced with crushed stone.
4. Remove all water, including rain water, encountered during trench excavation to an approved location by pumps, drains, and other approved methods. Keep trenches and site construction area free from water.
5. After excavation, the area between the final pipe grade and the trench soil bottom shall be filled with crushed stone materials as required, compacted to proper grade, and made ready for pipe laying.
6. Debris encountered in trench excavation for sewers and other pipelines shall be removed for the overall width of trench for the required trench bottom as indicated on standard District Detail Drawings. It shall be removed to a depth of 12" below the bottom of the pipe for pipes smaller than 24" in size; 18" below the bottom of the pipe for pipes 24" diameter and larger.
7. In all cases, materials deposited shall be placed so that in the event of rain, no damage will result to the work. Sedimentation and erosion control measures shall be in place and maintained pursuant to applicable regulatory authority.
8. The sides of all excavations shall be sufficiently sheeted, shored and braced whenever necessary to prevent slides, cave-ins, settlements or movement of the banks and to maintain the excavation clear of obstructions.
 - a. Wood or steel sheet piling of ample design and type shall have sufficient strength and rigidity to withstand the pressures exerted and to maintain the walls of the excavation properly in place and protect all persons and property from injury or damage.
 - b. Sheeting, shoring or bracing materials shall not be left in place unless as shown by the plans or permitted by the District.
 - c. All trench sheeting and bracing shall be left in place until the trench has been backfilled one foot above the top of the pipe.
9. Compliance with all applicable OSHA guidelines for all sheeting, shoring, and open-trench shall be mandatory..

J. TRENCH BACKFILL

1. The backfilling of pipeline trenches shall be started immediately after the pipe work has been installed. The initial bedding and haunching backfill material, placed to a height of one (1) foot above the top of the pipe, shall consist of

approved backfill material free from organic matter and deleterious substances, containing no rocks or lumps over 2" in any dimension and shall be compacted to 98% of maximum density, Modified Proctor, ASTM D-1557 Method A.

- a. Backfill Material shall be carefully placed and compacted throughout the entire area being backfilled.
 - b. Backfill placed above the initial one (1) foot above the top of the pipe shall be deposited in 6" layers (before compaction) and thoroughly compacted with power tools to 95% of maximum density, Modified Proctor ASTM-D-1557 Method A.
2. Where trenches are not under pavement, sidewalks, or in alleys, the backfill material one (1) foot above the top of the pipe zone shall be compacted to 92% maximum density, Modified Proctor ASTM D-1557 Method A to prevent settlement. Any deficiency in backfilling the trenches, or depressions caused by settlement, shall be repaired.
3. Where pipe trenches are cut across or along pavement, trenches shall be backfilled with select fill material placed and compacted in 6" lifts.
 - a. Replacement of road base and asphalt shall be in accordance with South Carolina Department of Transportation (SCDOT) regulations and shall require the placement of three (3) vertical feet of Controlled Density (CDF) Flowable Fill as Base Material prior to pavement placement.
 - b. Milling and overlay of repaired pavements shall be pursuant to SCDOT permit conditions.
4. Backfilling around structures shall be done in the manner specified above for pipe trenches by power tamping for the full depth of cut from the bottom of the finished grade.
5. All backfilling shall be done in such a manner as will not disturb or injure the pipe or structure over or against which it is being placed. Any pipe or structure injured, damaged or moved from its proper line or grade during backfilling operations shall be uncovered, repaired, and then re-backfilled as herein specified.
6. Where roadway open-trench crossings remove existing pavement markings, centerlines, and/or edge fog lines, replacement shall match preconstruction material quality, color, and configuration. Thermoplastic shall be placed to match existing marking materials or as required pursuant to SCDOT permit conditions.

11.

**SANITARY SEWER PUMP STATION
DESIGN STANDARDS**

SECTION 11

SANITARY SEWER PUMP STATION

DESIGN STANDARDS

A. GENERAL

1. The following sanitary sewer pump station design standards shall constitute the District's mandatory engineering design criteria unless specifically approved otherwise.
2. These design standards are applicable to all developments including but not limited to residential, commercial and industrial developments, subdivisions and/or parks requiring sewer service from the District.
3. Design standards for other than normal circumstances are to be presented to the District for approval prior to preparation of plans and specifications.
4. The Project Engineer shall submit the following design calculations:
 - a. Station service area and ultimate loading at build-out.
 - b. Flotation calculation (weight of station without pumps vs. uplift).
 - c. Cycle time calculation shall be a maximum of six (6) and a minimum of three (3) cycles/hour unless otherwise authorized by the District.
 - d. Provide certification that motor and control circuit will permit a minimum of twelve (12) starts /hour.
 - e. Motor run time shall be a minimum of three (3) minutes per cycle for the design cycle time pursuant to Item C above.
 - f. For pump stations requiring new force mains to manifold into existing force main networks, the Project Engineer shall provide a detailed hydraulic network analysis model indicating the duty point and operating conditions of all proposed and existing pump stations in the network.
 - 1) The design model shall include an analysis with one (1) pump "On" at each station for the existing network without the proposed station in operation and then modeled with the proposed station in operation in addition to one (1) pump "On" at all existing stations in the network.

- 2) A separate model analysis will be required to indicate the Duty Point of the proposed pump station with all existing stations "Off".
- g. Where proposed pump stations will require new force mains to discharge into existing gravity sewers, an impact analysis shall be required indicating that the proposed station discharge rate shall not exceed 50% of the full flow rate of the receiving sewer.
- h. Where discharge of the proposed pump station exceeds 50% of the full flow rate of the existing receiving sewer, the Project Engineer shall consult with the District to determine the extent of additional receiving system network analysis required.

B. GENERAL PUMP STATION DESIGN

- 1. Minimum of two (2) pumps of equal capacity, each capable of handling the design peak flow.
- 2. Capable of passing 3" diameter spherical solids, minimum.
- 3. Discharge piping: 4" diameter, minimum.
- 4. Peaking Factor: Minimum 2.5 or as determined by the District.
- 5. Wetwell level settings:
 - a. Distance between Pump "OFF" and Lead Pump "ON" shall be based on the cycle time as required pursuant to subsection A.4 above.
 - b. Distance between Lead Pump "ON" and Lag Pump "ON" shall be 1'-0", minimum.
 - c. Distance between Lag Pump "ON" and Audible Alarm "ON" shall be 1'-0", minimum.
 - d. The Telemetry Alarm shall be set ten (10) inches below Audible Alarm.
 - e. Distance between Telemetry Alarm elevation and Inlet Invert Elevation shall be: 6", minimum.
- 6. Provide a ball check valve and plug valve on each pump discharge line.
- 7. Pumps shall have an operating "Duty Point" within 20% below or 10% above the Best Efficiency Point (BPE) of the selected pump unless otherwise approved by the District.

8. Pumps shall be non-overloading for all duty points.
9. Provide by-pass connection as indicated on applicable Standard Detail Drawings.
10. Provide receiving manhole on influent line within pump station fence for by-pass pumping.
11. A Hydraulic network analysis shall be required for all new stations connecting to existing District forcemain transmission networks. The network analysis model shall include, at a minimum output data for one (1) pump running at each simultaneously pump station in the forcemain network (worse case) and output data for one pump at each station running independently (solo condition).
12. Minimum pump efficiency shall be 70% at the design duty point unless approved otherwise by the District.
13. All stations having VFD controlled pumps 20 HP and larger shall be equipped with standardized District approved Rosemount inline flow metering, on-site display, and SCADA/RTU equipment.

C. SUBMERSIBLE PUMP STATION

1. Provide opposite opening, single or dual, lockable, flood-proof access hatches with safety grate systems.
2. Provide components of the pump station as indicated on applicable Standard Detail Drawings.

D. PUMPS AND MOTORS

1. Acceptable pump manufacturers for submersible pumps are:
 - a. Flygt and ABS.No other pump manufacturers shall be allowed.
2. Pumps shall be equipped as follows:
 - a. Pumps shall be designed to handle peak flow with largest pump out of service.
 - b. Motors shall have a minimum NEMA MG 1 Part 31 Service Factor of 1.15 and shall be non-overloading over entire pumping range.

- c. Motors shall have Class F (155°C) insulation **and withstand Class B** (130°C) temperature rise with a service factor of 1.15 at the efficient point of the curve.
- d. Motor rpm shall not exceed 1800 rpms (8 pole). Motors larger than 20 rated horsepower shall be 6 pole (1,200 RPM) unless approved otherwise. Wire to water efficiency curves shall be submitted for approval.
- e. Three (3) phase power operation shall be required for all pump motors.
- f. Unbalanced voltage on motors under load shall not exceed 1.0% when measured at the motor terminals. Voltage shall be read with an accurate digital voltmeter; and recorded as part of the final inspection; calculation shall be NEMA Standard MG1-1972 (See Vol. Ia-11, No. 1, Jan/Feb 1974 IEEE Transaction Industrial Application).
- g. Power factor correction shall be required to 85%.
- h. Lightning arresters are required for all services.
- i. Pump and motor shall have a minimum of 400 series stainless steel shaft on motors under 10 Hp, above 10 Hp motors can have a chrome plated steel shaft.
- j. Impeller shall be keyed to shaft and be non-clog vane.
- k. Pump volute shall have replaceable wear rings.
- l. Lower seals shall be silicone carbide-to-silicone carbide unless approved otherwise by the district.
- m. B-10 bearing life shall be a minimum of 50,000 hours.
- n. Pump and motors shall have adequately sized 316 stainless steel lifting chain; length shall reach top of station plus an additional six (6) feet. Chain shall be 3/8" minimum welded hot-dipped 316 stainless steel link chain with a minimum safe working load four (4) times the weight of the largest pump.

Adequate designed lift chain hooks shall be imbedded into the side of the top slab and situated to facilitate easy removal of units.
- p. All piping shall be Class 53 DIP and all fittings shall be Class 150 DIP. All pipe and fittings shall be lined in accordance with Section 9.

- q. Motor shall be equipped with moisture detection probe and have moisture detection indication lamp mounted on control panel. Moisture detection shall cause motor shut down.
- r. Motor shall be equipped with overheat sensor and shall shut down the motor. Control panel shall have separate indicator lamp for overheat shut down.
- s. Motor shall be wired for lead-lag operation and shall be equipped for alternate cycle operation.
- t. Each motor shall have a separate run time totalizer
- u. Pump and motor shall be shipped with non-wicking electrical power cable, overheat cable and seal failure cable, factory installed. Cut ends are to be sealed and tagged at the factory for shipping.
- v. All pump motors less than twenty (20) HP shall be equipped with "soft start" motor controllers unless specifically approved otherwise.
- w. Motors twenty (20) rated horsepower and larger shall be equipped with Variable Frequency Drive (VFD) control.
- x. Where three phase (3-Ph) electrical power is not available, the District shall require VFD equipment to generate 3-Phase power from single phase electrical service.
- y. Motors in excess of 25 rated horsepower with VFD control shall be equipped with closed-loop cooling unless approved otherwise.

E. PUMP STATION PIPING

- 1. All piping shall be arranged as shown in the detail section.
- 2. Each pump discharge line shall have a ball check valve and a plug valve. All fittings to be flanged.
- 3. Provide Air Release Valve as shown on applicable standard District Detail Drawings.
- 4. All bolts, nuts and washers shall be 316 stainless steel.

F. WETWELL DESIGN CRITERIA

1. Size the wetwell based on the following:
 - a. Flow from proposed development and any associated future development. (Build-out Projection)
 - b. Capability to receive flows from surrounding areas as determined by District.
 - c. Formula:
$$V = \frac{T}{\left(\frac{1}{Q-S} + \frac{1}{S} \right)}$$

Where: V = Effective volume of wetwell (in gallons)
T = Total Cycle Time for one pump cycle (in minutes)
Q = Pumping rate (GPM)
S = Flow into wetwell (GPM)
 - d. "T (Total Cycle Time) will normally be fifteen (15) minutes, subject to subitem A.4 above, unless approved otherwise by the District.
 - e. Minimum allowable wetwell diameter shall be eight (8) feet. No exceptions shall be allowed.
2. Normal operating volume shall prevent any one pump from starting more than three (3) times per hour (maximum six (6) cycles per hour with alternating pumps after each cycle.).
 - a. Pump run time shall be a minimum of three (3) minutes per cycle.
3. Interior components:
 - a. Type 316 stainless steel all hardware including, but not limited to, the following:
 - 1) Lifting chains
 - 2) Anchor bolts
 - 3) Bolts, nuts, and washers
 - 4) Guide rails - to be compatible with Flygt Dual Guide Rail System.

- 5) Rail guides
 - 6) Cable holder
- 4. Primary Level pump control shall be by pressure transducer mounted as indicated on the applicable District standard Detail Drawing. Back-up pump control shall be by floats as indicated and specified elsewhere.
 - 5. Locate back-up control floats where flow from the inlet pipe will not interfere with normal operation of the floats at all operating levels.
 - 6. Pump power and control cable length shall be as required for the longest cable run plus ten (10) feet. Provide a stainless steel hanger and strain relief sleeves for all power cables.
 - 7. Line interior of wetwell with 125 mills of Raven 405 ultra-high build epoxy. Coat all ferrous piping with the same epoxy material as specified for lining.
 - 8. Locate to allow access with vacuum truck and boom truck.
 - 9. Minimum 6" perimeter fillett on wetwell floor
 - 10. Horizontal area of level bottom shall provide necessary area for proper installation and operation of the pumps or pump inlets.
 - 11. Provide minimum 4" DIP with 180" vent cap with 316SS screen for venting the wetwell extended 1'– 3" above the 100-year flood elevation.
 - 12. The base section of the precast concrete wetwell shall be placed level, on a base of twenty four (24) inches minimum of compacted SCDOT No. 57 granite aggregate. All over-excavated areas deeper than 24" below the wetwell bottom shall be filled with compacted aggregate.
 - 13. Steps should NOT be used in wetwells.
 - 14. Influent line shall terminate a minimum of ½" inside the wetwell. Influent penetrations shall be secured with dowel "Link-Seals" or approved equal.
 - 15. All hatches shall be flood-proof aluminum with stainless steel hasp, hinge and safety grate system.

G. ELECTRICAL

- 1. Electrical design of pump station shall conform to current editions of NFPA 70 (National Electric Code) and NFPA 820 (Standard for Fire Protection in Wastewater Treatment and Collection Facilities). The Electrical Equipment

mounting Rack and all control cabinets shall provide minimum cleanliness pursuant to applicable codes.

- a. All electrical equipment, panels, Control Panels, and switch gear shall be mounted 1.25 feet above the applicable FEMA Base Flood elevation.
 - b. District standard aluminum rack mounting or special District approved aluminum platform mounting shall be provided as required for the pump station site.
2. All areas designated as hazardous as defined by NFPA 820 shall be so delineated on the contract documents.
 3. Electrical service shall be designated to accommodate the ultimate capacity of the pump station. Coordinate three phase service with utility company prior to ordering pumps.
 4. Coordinate location of meter pole with local utility and Owner. Install main breaker with lightening arrestor on meter pole. Main breaker shall be NEMA 4X stainless steel, located a minimum of 1'-3" above the 100 year flood elevation gasketed with drip shield.
 5. Pump stations without on-site emergency power generators, shall be equipped with a double throw Manual Transfer Switch (MTS) sized to accommodate the calculated loads.
 - a. Transfer switch shall be stainless steel NEMA 4X, located a minimum of 1'-3" above the 100 year flood elevation, gasketed with drip shield.
 - b. Provide a receptacle with reversed contacts for the District's portable generator in accordance with the Table below.

DESCRIPTION	HUB SIZE	CROUSE HINDS PART # WITH BACK BOX	CROUSE HINDS PART # RECEPTACLE HOUSING ONLY
100 amp, 3 wire 4 pole	2"	Area 10426	AR 1042-S22
200 amp, 3 wire 4 pole	2"	Area 20426	AR 2042-S22

6. Provide adequately sized emergency generator and automatic transfer switch (ATS) on all stations with 30 Hp and larger pumps. Contact the District for specifications on this equipment.

- a. Emergency Generators shall be either natural gas (where available and required) or diesel powered with a minimum 72 hour tank running capacity and platform mounted 1.25 above the applicable FEMA Base Flood Elevation. Coordinate with the District prior to commencing final design for specific requirements for the equipment platform.
7. All electrical equipment shall be located outside of the hazardous areas, but the conduit seals shall be located within ten (10) feet of the classification boundary.
8. All conduit shall be Schedule 80 PVC.
9. Provide support for electrical equipment in accordance with details.
10. Provide 35-watt LED floodlight with photo cell and weatherproof switch at each site. Mount on top of control panel support structure to light wetwell.
11. Wetwell float switch hangers shall be located at the edge of the hatch.
12. Provide concrete pad for pump control panel only, when supported on legs to extend out three (3) feet from the face control panel.
13. All electrical equipment shall be located 1.25 feet above the 100-year Base Flood Elevation in accordance with subitem 1.a above.
 - a. All electrical equipment located below 1.25 feet above the 100-year flood level shall be NEMA 6X.
14. Provide a complete addition to the District's Supervisory Control and Data Acquisition System (SCADA). Contact the District for specifications on this equipment.

H. PUMP STATION SITE

1. Minimum property size: fifty (50) feet square.
2. Site shall be serviced by a paved all weather road. Road and site drainage shall be included and approved by appropriate agency.
3. Access road: Vehicle & Equipment Apron.
 - a. Minimum 20 foot wide.
 - b. 8" GABC or FLBC and 2" SCDOT Type-C ACSC as indicated on applicable standard District Detail Drawings.

4. Site Area: Pavement within pump station site perimeter fence as indicated on applicable standard District Detail Drawings:
 - a. 6" SCDOT No. 789 granite aggregate with applicable soil poisoning and woven geotechnical fabric suitable as a vegetation barrier.
5. Fencing of Station Site
 - a. All pump stations shall have 8'-0" high Ground contact pressure treated No. 1 SYP KDAT wooden vertical slat perimeter fencing as indicated on the District's Standard Fencing Detail Drawing.
 - b. Alternative commercial grade chain link black vinyl coating fencing materials and fence design may be considered on a case by case basis, provided the Developer or HOA/POA pays all additional costs required for structured fencing.
6. Minimum sixteen (16) feet wide opening, two (2) section heavy metal frame and post gate to allow entrance of service trucks and vacuum truck without blocking the main roadway.
 - a. Single personnel gate shall also be required as indicated on the District's Standard fencing Detail Drawing.
7. Design site layout to allow access of service trucks and vacuum truck to the wetwell.
8. Power pole should be located outside the fence area and should be located in such a manner so the electric meter can be easily read from outside the fenced area.
9. All electrical power cables within the site shall be underground. No overhead power lines shall be allowed to cross the site.

I. SPARE PARTS FOR SUBMERSIBLE PUMP STATION

1. Contractor shall furnish on or before final inspection spare parts identified in Section 12.

12.

**SANITARY SEWER PUMP STATION
MATERIALS FOR CONSTRUCTION**

SECTION 12
SANITARY SEWER PUMP STATION
MATERIALS FOR CONSTRUCTION

A. WETWELLS

1. Use manhole sections complying with Section 6.
2. Wetwell structure.
 - a. Comply with JIPSD Standard Pump Station Detail Drawings for site layout and above grade equipment and piping configurations.
3. Wetwell vent:
 - a. Double Cast Iron FE 90° Bends vent cap with stainless steel 1/16" mesh screen.
 - b. Ductile iron connection piping, sized for adequate wetwell air volume exchange per pump cycle. (Minimum 4" DIP).
 - c. Painting and Lining:
 - 1) Primer - one (1) coat of Tnemec Polyuraprime.
 - 2) Paint - two (2) coats of Tnemec Epoxyl Polyurethane Series 66 or 69 high build epoxoline at 5 mils thickness.
 - 3) DI Pipe shall be Epoxy lined as specified elsewhere.
4. Cable holders:
 - a. Use six (6) hooks, 316L stainless steel
 - b. Acceptable manufacturer: Halliday Metals.
5. Interior lining:
 - a. Provide 125 mills of Raven 405 Ultra High Build Epoxy Lining or approved equal by the District.
6. Other pump station appurtenances.

- a. Comply with JIPSD Standard Pump Station Detail Drawings.

B. SUBMERSIBLE PUMP STATION

1. Acceptable pump manufacturer: Flygt and ABS.
2. Provide a qualified pump service technician for the following periods of time for each pump station.
 - a. Start-up and performance testing: One day - One trip.
3. Spare parts:
 - a. Provide the following minimum spare parts:
 - 1) One set of wear rings.
 - 2) One of each type relay.
 - 3) One spare soft start or VFD as applicable.
 - 4) One pump duplex controller manufactured by MPE.
 - 5) One float switch with cable.
 - 6) One pressure transducer by Contegra, Model SLX130, 4-20 MA.
 - 7) One voltage phase monitor.
 - b. Two (2) complete sets of record drawings for wetwell, electrical, electronic schematics (and three (3) copies and two (2) CD's of O&M Manuals, with factory pump curves for pumps installed), copies of all certified test and inspection data, and a completed start-up report by the pump manufacturer.
 - c. Package in one container all spare parts and clearly identify on the outside what the unit is for.
 - 1) Seal tightly, properly protect for long term storage, and deliver to the District.
4. Warranty:

- a. The pump manufacturer shall warrant the units being supplied against defects in workmanship and material for a period of five (5) years or 10,000 hours under the Municipal Wastewater Permanent Installation Warranty Policy under normal use, operating and service. The warranty shall be in printed form and apply to all similar units.
5. Pumps:
- a. General:
 - 1) ANSI 125 lb standard cast iron flange fitting or cast with volute.
 - 2) Pump components: cast iron, ASTM A48, Class 30 or 35B.
 - 3) All exposed fasteners and washers: Type 316L stainless steel.
 - 4) Pump lift handle:
 - a) Type 316 stainless steel.
 - 5) Coating:
 - a) All components coming into contact with sewage, except stainless steel, with a sewage resistant coating.
 - b) Pump exterior: PVC epoxy primer and a chlorine rubber paint finish.
 - b. Impeller:
 - 1) Single or double vaned, semi-opened, non-clog type, unless approved otherwise.
 - 2) Gray cast iron, Class 35B, balanced in accordance with ISO 1940/1 Grade G6.3.
 - 3) Paint with one coat of alkyd resin primer.
 - 4) Provide wear ring consisting of a replaceable stationary ring fitted to the volute inlet.
 - 5) Sliding fit between the impeller and the shaft with one key and locking bolt or nut with threads cut opposite to the direction of rotation.

- 6) All impellers shall be capable of passing a three (3) inch diameter solid sphere.
- c. Volute:
- 1) Single piece, gray cast iron, Class 35B non-concentric design.
 - 2) Minimum inlet diameter shall be four (4) inches.
 - 3) Discharge flange seal design and base mounting shall be as specifically approved by the District.
- d. Shaft:
- 1) Less than 10 Hp ANSI Type 420 stainless steel.
 - 2) 10 Hp and above chrome plated steel.
- e. Bearings:
- 1) Two (2) permanently lubricated bearings.
 - 2) L-10 bearing life of 100,000 hours unless approved otherwise.
 - 3) Upper bearing: minimum single or double cylindrical roller bearing or approved equal.
 - 4) Lower bearing: minimum two row angular contact ball bearing or approved equal. Pumps of ten (10) Hp and larger shall have bearing design as specifically approved by the District.
- f. Watertight seals:
- 1) Nitrile rubber O-rings or approved equal.
 - 2) Fittings:
 - a) Accomplished sealing by metal-to-metal contact between machined surfaces.
 - 3) Gaskets, elliptical O-rings, grease or other devices are not acceptable.

g. Mechanical seals:

- 1) Tandem mechanical shaft seal system consisting of two totally independent seal assemblies.
- 2) Operate the upper of the tandem set of seals in an oil chamber to provide hydro-dynamic lubrication to seal faces at a constant rate.
- 3) Upper seal set: one stationary Sintered Silicon Carbide (SSC) or approved tungsten carbide ring soldered to a holder of stainless steel and one positively driven rotating carbon ring to function as an independent secondary barrier between the pumped liquid and the stator bearings.
- 4) Lower seal set: a stationary ring soldered to a holder of stainless steel and a positively driven rotating ring, both of "silicone carbide" or approved equal.
 - a) Hold each interface in contact by its own spring system.
- 5) Require neither maintenance nor adjustment, easily inspected and replaced.
- 6) Provide all seal hardware of stainless steel.

h. Motor Cooling:

- 1) Pump motors twenty (25) Hp and larger shall be provided with closed-loop glycol based cooling systems specifically approved by the District.
- 2) The use of open-loop cooling jacket systems utilizing the pumped medium as a coolant shall not be allowed unless specifically approved by the District.

6. Pump motor:

a. General:

- 1) Submersible, explosion proof type, designed for continuous duty, capable of sustaining a minimum of fifteen (15) starts per hour.
- 2) Integral motor and pump.

- 3) Air filled, squirrel cage induction, shell type design, Class H insulation system, Class H materials rated for continuous duty in 408C (1048F) liquids.
 - 4) Cast iron motor frame and end shields.
 - 5) Stainless steel hardware and shaft.
 - 6) NEMA MG 1 Part 31 Service factor shall be 1.15 minimum.
 - 7) Stator:
 - a) Heat-shrink fitted to shaft.
 - b) Dip and bake in Class H varnish.
 - c) Do not use bolts, pins or other fastening devices requiring penetration of the stator housing.
 - 8) Aluminum rotor bars and short circuit rings.
 - 9) Motor and pump shall be designed, manufactured, and assembled by the same manufacturer.
 - 10) Motor shall be protected by separate moisture detection and overheat sensors each with separate shut-down and control panel alarm circuits and lamps.
- b. Cable entry water seal system.
- 1) Single cylindrical elastomer grommet, flanked by stainless steel washers, all having a close tolerance fit against the cable outside diameter and the entry inside diameter and compressed by the entry body containing a strain relief function, separate from the function of sealing the cable.
 - 2) Bear assembly against a shoulder in the pump top.
 - 3) Separate the cable entry junction chamber and motor by a stator lead sealing gland or terminal board to isolate the motor interior from foreign material gaining access through the pump top.
 - a) Do not use epoxies, silicones, or other secondary sealing systems.

- c. Provide pre-lubricated bearings:
 - 1) Minimum B-10 life of 50,000 hours.
 - d. Thermal protection:
 - 1) Motor rated thermally to NEMA MG1-12.42.
 - 2) Three (3) thermostatic switches (one in each phase) in the stator windings.
 - e. Junction chamber:
 - 1) Seal from the motor by elastomer compression seal (O-ring).
 - 2) Connect between the cable conductors and stator leads with threaded compressed type binding, post permanently affixed to a terminal board.
7. Pump Guide Rail Bracket:
- a. Permanently installed discharge connection system.
 - b. Pump(s) automatically connected to the discharge connection elbow when lowered into place.
 - 1) Easily removed for inspection or service.
 - c. Accomplish sealing of the pump unit to the discharge connection elbow by a simple linear downward motion of the pump. Seal faces shall be machined or gasketed subject to District approval.
 - d. Pump guide rail bracket support shall be cast as an integral part of the pump unit.
 - e. Guide the entire weight of the pumping unit by a dual rail system and press tightly against the discharge connection with an approved, mechanical elbow with metal-to-metal or approved rubber seal contact.
 - f. No portion of the pump to bear directly on the floor of the sump.
8. Discharge elbow (Flygt Only):
- a. Gray cast iron: ASTM A48, Class 30 or 35B.

- b. Vertical leg:
 - 1) ANSI Class 125 lb. flange.
 - c. Provide integral cast iron base.
 - d. If necessary, size elbow with a reducer to match discharge piping.
9. Guide Rails:
- a. Guide rails shall be Schedule 40, Type 316 stainless steel pipe, of the diameter as specified by the pump manufacturer.
 - b. 316 stainless steel Flygt upper guide rail brackets.
10. Intermediate Guide Rail Support Brackets:
- a. 316 Stainless Steel guide rail support brackets at intervals of no greater than twenty (20) vertical feet of guide rail.
11. Lift chain:
- a. Provide each pump and motor with adequately sized Type 316 stainless steel lifting chain.
 - 1) Minimum 3/8" welded stainless steel link chain with a working load no less than four (4) times the pump weight.
 - b. Length to reach top of station plus an additional six (6) feet.
 - c. Attach upper end of chain to wetwell access frame with Type 316 stainless steel clip and stainless steel eye nut.
 - d. Connect chain to pump using Type 316 stainless steel screw pin and shackle.
12. Hardware:
- a. All bolts, concrete anchors, machine screws, nuts, washers, and lock washers for complete assembly of wetwell access cover, guide rails, and discharge elbow to be Type 316 stainless steel.

13. Wetwell Access Hatches:

- a. Fabricate from welded aluminum to provide a minimum working load rating of 300 lbs. per square foot or H-20 live load, whichever is greater.
- b. Provide dual hinged door lockable and cam-lock sealing clamps to withstand a ten (10) feet water column.
- c. Provide "Safety Orange" grate hinged system for all hatch openings 24 inches square and larger.
- d. All hardware: Stainless steel.g.pe 316 stainless steel support bracing with a self-locking hinge mechanism.
- e. Flood-proof hatches and safety grates shall be equipped with positive locking hold-open latch mechanisms complete with compression spring activators.

14. Pump control panel:

- a. Enclosure:
 - 1) Code gauge 316L or 308 stainless steel as approved by the District: NEMA 4X, gasketed with drip shield and white powder coated exterior finish.
 - a) Provide for rack mounting with exterior flanges.
 - b) Provide leg stand kit for enclosures with a height greater than 48".
 - 2) Single 3-point locking latch.
 - a) Attach with stainless steel screws.
 - 3) Removable aluminum inner swing panel.
 - a) Minimum thickness of 0.125".
 - b) Continuous stainless steel piano type hinge.
 - c) Minimum horizontal swing of 90°.
 - 4) Use removable aluminum back panel.

- a) 0.125" minimum thickness.
 - b) Attach to enclosure on collar studs.
 - c) Do not use self-tapping screws.
- 5) Engraved nameplates on door mounted hardware.
 - a) Attach with stainless steel screws.
- b. Motor starting components:
 - 1) NEMA rated "soft starts" or VFD motor contactor's. Across-the-line magnetic starters shall not be allowed.
 - a) Provide phase failure, undervoltage release and overload protection on all three phases.
 - i) Acceptable product: Allen Bradley 813S or Diversified SLA-230-ASA.
 - b) Variable Frequency Drives (VFD's) shall be required for pump motors greater than twenty (20) and greater HP or as directed by the District.
 - c) VFD motor controllers shall be provided to supply 3-phase electrical power where the proposed pump station site cannot be reasonably served by 3-phase electrical power.
 - 2) Circuit breaker and operating mechanism:
 - a) Provide thermal magnetic air circuit breaker having a minimum symmetrical RMS interrupting rating of 10,000 amperes at 240V or 14,000 amperes at 480V.
 - b) Provide padlockable operating mechanism on each motor circuit breaker.
 - c) Locate mechanism operator handles on exterior of the inner swing panel with interlocks which permit the panel to be opened only when circuit breakers are in the OFF position.
 - d) Manufacturer shall be Square D or approved equal.

c. Components:

- 1) Provide end mounted line voltage air conditioning units by Hoffman, sized as approved by the District for all panels equipped with VFD's for pump motors twenty (20) Hp and larger.
- 2) Provide the following components with the panel:
 - a) Push button resets for VFD's.
 - b) Condensation heater.
 - c) High level alarm indication light.
 - d) Alarm bell silence.
 - e) GFI 20A duplex receptacle with stainless steel cover.
 - f) Weatherproof switch for flood lights.
 - g) Control relays.
 - h) Remote alarm terminals.

d. Pump alternator relay:

- 1) Provide electrical design.
 - a) Acceptable product: Model DUP-120-023P.

e. Provide the following components mounted on the back plate:

- 1) 120V control circuit transformer (open core and coil type) with primary circuit breaker and secondary circuit breakers for:
 - a) Control.
 - b) Condensation heater.
 - c) Flood light (35 watt LED).
 - d) Remote telemetry unit (1200 watts minimum).
 - e) High Level alarm light and bell.

- 2) Lightning arrestor.
 - a) Acceptable product: Delta Type "LA".
- 3) Provide power terminals and control terminals.
- g. Design control sequence so that panel is functioning automatically again after a power failure and manual reset is not necessary.
- h. Provide a terminal board for connection of line, level sensors and remote power and alarms.
- i. Provide elapsed time meters for each pump.
 - 1) Six digit, non-resettable digital read-out.
 - 2) Indicate total run time in hours and tenths.
- j. Provide high water alarm activated by float switch.
 - 1) Front panel mounted silence switch.
 - 2) 120V AC.
 - 3) Utilize standard 40 watt incandescent bulb or LED, vapor tight, alarm light with red globe, guard and mounting hardware.
 - a) Mount on side of panel.
 - b) Provide threaded type globe.
 - 4) 120V AC alarm bell
 - a) Weatherproof housing
 - b) Mounting lugs
 - c) Conduit tap
 - d) Acceptable product: Edwards No. 340-4N5/348
 - 5) Bell and light
 - a) Operate simultaneously under alarm conditions.

- b) On at high level.
- k. Control relays:
 - 1) Heavy-duty industrial grade, tube base, plug-in type.
 - 2) Silver cadmium oxide contacts and LED indicating light.
 - 3) Acceptable products:
 - a) Allen Bradley, Bulletin 700, Type H.
 - b) Square D, Class 8501, Type K
- l. Electrical schematic:
 - 1) Provide a number indexed, laminated electrical schematic diagram of the pump controls including terminal board connections.
 - 2) Permanently mount on the inside of the enclosure door.
- m. Attachment screws.
 - 1) 316 stainless steel.
- n. Wiring:
 - 1) Factory wired completely, except for power supply, motor, temperature switches and moisture sensor, connections, and, float switches. Provide terminal strip for all exterior connections.
 - a) Comply with applicable standards of National Electric Code.
 - b) Color code and number as indicated on factory wiring diagram.
 - c) Control wire: MTW 90°C #14 AWG.
 - 2) Electrically ground all components to a common ground screw mounted on the removable back panel.

- 3) Group all wiring in plastic wire troughs except wiring from the 14 gauge backplate to the door shall be done in separate bundled harnesses for control circuits.
- o. Level control and motor power cable:
 - 1) Provide power and control cables of the required length to terminate in control panel without splicing unless directed otherwise by the District.
 - 2) Minimum length of all cables as measured from the pump to the Control Panel connection shall be equal to the installed length for the most remote pump plus ten (10) additional feet.
- p. Remote alarm contacts and terminals to RTU:
 - 1) Provide contacts for the following:
 - a) Generator on.
 - b) Generator off.
 - c) Power off.
 - d) High level.
 - e) Pump on (all pumps).

C. LEVEL CONTROL SYSTEM

- 1. The primary pump control system shall utilize a District approved pressure transducer as specified and indicated on the applicable Standard District Detail Drawing.
- 2. Use five (5) back-up float switches.
- 3. Floats
 - a. Single action mercury-free design.
 - b. Capable of withstanding water penetration under 25' of water.
 - c. 3 to 1 safety factor, minimum.

- d. Use integrally weighted floats, do not use float switches that require pole mounting.
 - e. Acceptable product: Anchor scientific Type S normally open.
- 4. Provide for duplex operation:
 - a. Utilize "LEAD/LAG" principal with five (5) float switches.
 - 1) One for "LEAD" "Pump On".
 - 2) One for "LAG" "Pump On".
 - 3) One for a common "OFF" level.
 - 4) One in high level (SCADA. Alarm)
 - 5) One for "high" level alarm (Claxton and Light).
 - b. Design circuitry so that operation of the "LAG" pump start circuit is not contingent on proper operation of the "LEAD" pump start circuit.
- 4. Switches:
 - a. Seal in a polypropylene housing.
 - b. No less than sixty (60) feet of cable; minimum length shall be as required pursuant to subpart 14.0.2) above.
 - c. Polypropylene cord grips and mounting hardware.

D. BALL CHECK VALVES

- 1. Furnish Ductile Iron bodied valves with flanged ends conforming to ANSI B16.1 Class 25.
- 2. Ball Check valves shall be as manufactured by HDL, Type 5087 unless approved otherwise.
- 3. Provide hollow steel sinking valve balls with vulcanized nitrite rubber ball coating:
- 4. All bolts, nuts, and fasteners shall be 316 stainless steel.

5. Ball Check Valves shall only be vertically mounted and installed in above grade piping as indicated on Standard District Detail Drawings.

E. PLUG VALVES

1. General:
 - a. Provide non-lubricated, eccentric type plug valves having resilient faced plugs, complying with AWWA Standard C504 and other requirements specified herein.
 - b. Furnish flanged or mechanical joint end connections as indicated on the Drawings.
 - c. Provide valves capable of drip-tight shutoff up to full rating with pressure in either direction. Pressure ratings shall be 150 psi for 4" through 12", 125 psi for 14" through 36", and 100 psi for 42" and larger.
 - d. Valve bodies shall be cast iron complying with ASTM A 126, Class B and AWWA Standard C-504-80, Section 5.4.
 - e. All exposed nuts, bolts, springs, etc. shall be 316L stainless steel on all valves.
2. Port areas:
 - a. Four inch through ten (10) inch valves, shall be 80% ported.
 - b. Twelve (12) inch and larger valves shall be 100% ported unless approved otherwise by the District.
3. Seats:
 - a. Provide corrosion resistant seats complying with AWWA Standard C507 and AWWA Standard C504, L.R..
4. Bearings:
 - a. Bearings to comply with AWWA Standard C507-73 and AWWA Standard C504.
5. Resilient plug facing:
 - a. Provide neoprene plug facings vulcanized to the plug .
6. Actuators:
 - a. Manual valves to be provided with lever or gear actuators and tee wrenches, extension stems, floor stands, , etc., as indicated on the Drawings.
 - 1) Provide a lever for each lever-operated valve.

- 2) Provide one tee wrench for every five valves utilizing the tee wrench operation.
 - b. Valves furnished for installation in a valve box to be provided with a 2" square operating nut and extension within 18" of the top of the valve box.
 - c. Provide six (6) inch and larger valves with gear actuators.
 - 1) Handwheel components manufactured in accordance with AWWA Standard C504-74 Section 11.2.3.
 - 2) Gear actuators, above grade service:
 - a) Provide valve position indicator and an adjustable stop to set closing torque.
 - b) All exposed nuts, bolts and washers to be stainless steel.
 - 5) Gear actuators, below grade and buried service:
 - a) Provide neoprene seals on all shafts and gaskets on actuator covers to prevent entry of water and dirt.
 - b) All exposed nuts, bolts and washers to be stainless steel.
 - c) Plug valves mounted below grade or intended for buried service shall require suitable exterior epoxy coating protection specifically approved by the District.
7. Acceptable Manufacturer: DeZurik.

13.

SANITARY SEWER PUMP STATION CONSTRUCTION PROCEDURES

SECTION 13

SANITARY SEWER PUMP STATION

CONSTRUCTION PROCEDURES

This section covers construction procedures normally required for work. It does not cover any special construction procedures which may be encountered for abnormal conditions.

Special construction procedures are to be presented to the District by the Developer's Design Engineer.

A. GENERAL

1. An inspection of the rebar and electrical conduit by the District will be required prior to the pouring of any concrete.
2. Contact the District to schedule an inspection.

B. SUBMERSIBLE SEWAGE PUMPS

1. Use base plate as a template for drilling individual hole patterns.
 - a. Mount base plates using $\frac{3}{4}$ " Type 316 stainless steel expansion anchors.
2. Set up 60° slope on both sides of wetwell using Portland cement grout.
3. Assemble guide rails to access frame and plumb the assembly.
4. Install float switch cable holder and pressure transducer drop pipes as indicated on standard Detail Drawings:
 - a. Use Type 316 stainless steel anchors.
5. Install pumps and piping, plumbing assembly for proper alignment and fit.
6. Seal influent sewer inlet into wet well with two (2) sets of approved Link-Seals or District approved equal. Seal all above grade discharge piping penetrations of top slab with link-seals unless directed otherwise.
 - a. Pump risers and above grade piping 8" diameter and larger shall be provided with District approved thrust flanges secured to the station top slab.

7. Install power cables using cable strain reliefs and cord grips (stainless steel).
8. Field wiring:
 - a. Extend grounding wire from control panel main ground screw to external ground as shown in details.
 - 1) Comply with all applicable NEC and local municipal or county electrical codes.
 - b. Make motor lead, float switch, temperature sensor, moisture sensor, and power supply connections.
 - c. Seal all conduits between junction box and control panel as shown in details.
 - 1) Comply with all applicable National Electric Code and local municipal or county electrical code requirements.
 - d. Seal conduit terminations in control panel with duct seal.
 - e. Only properly licensed personnel shall install electrical equipment and wiring.
9. Pump testing:
 - a. Provide the following inspections and tests on each pump before shipment from factory by the manufacturer:
 - 1) Check impeller, motor rating and electrical connections for compliance to the customer's purchase order.
 - 2) Make a motor and cable insulation test for:
 - a) Moisture content.
 - b) Insulation defects.
 - 3) Prior to submergence, "bump start" the pump dry to establish correct rotation and mechanical integrity.
 - 4) Run the pump for 30 minutes submerged, at a minimum of six (6) feet.
 - 5) After operational test No. 4, perform the insulation test (No. 2) again.

- 6) Supply a certified pump performance curve with a written report stating the foregoing steps have been performed for each pump two (2) weeks prior to shipment.
- b. Provide the following tests after installation:
- 1) In presence of the Developer's Engineer and the District:
 - a) Remove pump from wet well structure.
 - b) Replace, demonstrating proper alignment and operation of mating parts and guide rail systems.
 - 2) Operate pumps utilizing manual and automatic modes.
 - 3) Demonstrate proper operational sequences, including alarm conditions.
 - 4) Perform "clear water" start-up testing measuring and recording amperage, voltage, and stabilized Duty Point (pumping rate and calculated Total Dynamic Head) for:
 - a) Each pump operating separately.
 - b) Both pumps operating simultaneously.
 - c) Pumps equipped with VFD control shall be started at the lowest Hz level that will provide a minimum flow of 100 GPM then ramped up in 10 Hz increments to 60 Hz. Operation at each speed increment shall be stabilized and the duty point recorded before advancing to the next higher increment.
 - d) New pump stations discharging into existing force main networks serving multiple stations shall require a coordinated shut-down of all other stations in the network during start-up testing.
 - 5) The Developer's Representative shall conduct testing of pump station pumps and controls to verify operating parameters are met per design criteria. The Developer's Representative shall be responsible for coordinating the pump manufacturers, the District representative, and the contractor for all start-up testing and commissioning.

- 6) The design engineer shall submit three (3) copies of final test report to the District.
- 7) The Developer's Engineer shall include an annotated certified pump curve for each pump installed indicating the measured duty point and Best Efficiency Point (BEP).

C. REMOTE TELEMETRY UNIT (RTU)

1. Install in strict accordance with the District's recommended installation procedures.
2. Upon completion of the installation an inspection shall be conducted of the installed equipment by a District Inspector.
3. Contact District for RTU specifications.

14.

ALTERNATIVE WASTEWATER
COLLECTION SYSTEMS (AWCS)
DESIGN STANDARDS

SECTION 14

JIPSD ALTERNATIVE WASTEWATER COLLECTION SYSTEMS (AWCS) DESIGN STANDARDS

Whenever possible, wastewater collection system extensions shall be constructed as conventional gravity sewer collection facilities and shall be built in accordance with the latest revision of the *Wastewater Collection System Specifications* adopted by James Island Public Service District (JIPSD).

A. New Subdivisions

To be considered for District approved AWCS sewer service, the Developer shall first submit a detailed feasibility report for JIPSD review and approval, to justify the technical necessity to utilize AWCS service. The report shall address hydraulic, construction, cost, and operational considerations. The following design criteria, or those mandated by South Carolina Department of Health and Environmental Control (SCDHEC) in *Standards for Wastewater Facility Construction* (R.61-67), shall apply. If a conflict exists, the more stringent requirements shall govern.

1. Individual grinder pump systems for designated lots within a proposed subdivision shall only be allowed under the following circumstances:
 - a. Conventional gravity sewer service is not technically feasible for all lots within a proposed subdivision containing a maximum of ten (10) lots. Subdivisions containing more than ten (10) residential lots shall be required to provide sewer service by conventional methods including the construction of conventional, public owned and operated pump stations, forcemains, and appurtenances pursuant to JIPSD requirements.
 - b. The maximum number of lots allowable in any subdivision greater than 10 lots to be sewer by AWCS service shall be four (4) lots or 40% (rounded down to the nearest whole number) of the total number of lots within a proposed subdivision, whichever is less.
 - c. The minimum lot size of any lot served by individual AWCS grinder pumps shall be one third (1/3) of an acre irrespective of applicable minimum lot area zoning requirements.
2. Applications for consideration of AWCS service shall include a justification stating and demonstrating why conventional gravity system is not feasible. Financial feasibility shall not be sufficient justification to allow AWCS service within a new subdivision.

3. All deeds and plats utilized for the sale or transfer of property within a subdivision containing AWCS lots shall clearly indicate which specific lots are serviced by AWCS in lieu of conventional gravity sewer service.
4. Each approved individual AWCS service shall be designed and constructed pursuant to District requirements and deeded to the JIPSD for ownership, operation, and maintenance following final testing and approval.
 - a. Lots requiring AWCS service shall be specifically identified on the final, recorded subdivision plat.
 - b. A preliminary copy of the proposed subdivision plat identifying each lot to be served by AWCS facilities shall be submitted to the District for review and approval.
 - c. Final, fully executed and recorded deeds dedicating all AWCS facilities to the District shall be provided to the District prior to receipt of operational AWCS approval from the District.

B. New AWCS Residential and Commercial Customers

All new AWCS residential and commercial customers shall comply with the following requirements:

1. Individual AWCS components shall be designed, located and constructed in accordance with applicable JIPSD standard specifications. Installations shall be performed by a utility/contractor licensed by the State of South Carolina and approved by the District.
2. It shall be the Applicant's responsibility to obtain a SCDHEC Construction Permit for each proposed AWCS service. The District shall be the applicant for all AWCS forcemain encroachment permits to be located within public rights-of-way. Multiple AWCS services within a single subdivision shall be permitted under a consolidated SCDHEC Construction Permit.
3. A SCDHEC Operating Permit for each separate AWCS service shall be provided to the District prior to JIPSD accepting new AWCS facilities for ownership, operation, and maintenance.
4. All JIPSD fees shall be paid prior to construction of AWCS facilities.
5. AWCS pump and service force main installations located on individual lots shall require applicable easements and granted rights-of-entry to allow District access to the grinder pump assembly, control panel, force main, service breaker disconnect, and appurtenances for the purpose of operating and maintaining these installations.

C. Existing Lots

If an existing, undeveloped lot exists within the JIPSD service area, the individual lot owner may be allowed to install one (1) AWCS service to provide sewer service to the property provided all of the following conditions are met:

1. The owner complies with all JIPSD Construction Standards.
2. Conventional gravity sewer service is not technically feasible.
3. Only one (1) building and one (1) customer per lot can utilize the AWCS.
4. The owner is responsible for all fees associated with the construction of the AWCS.
5. The owner is required and is solely responsible for obtaining all SCDHEC, SCDOT and all other applicable permits. A copy of all approved permits shall be supplied to the JIPSD prior to construction.
6. All JIPSD fees must be paid prior to construction.
7. All applicable AWCS components shall be deeded to the District for ownership, operation, and maintenance.
8. The individual lot owner shall pay all applicable fees and monthly service charges as set forth in Appendix A, "Wastewater Rates & Fees" of the JIPSD Wastewater Collection System Use and Rate Ordinance when a single AWCS unit discharges into a manhole.
9. See subsection B.5. above for required easements and rights-of-entry requirements to be granted to the District.

D. AWCS Equipment

1. Each AWCS installation shall consist of the District Standard E-One model DH071-93 "packaged", pre-wired, and pre-plumbed pump and wet well assembly installed as specified in Section 17 and pursuant to applicable standard District Detail Drawings.
2. AWCS electrical service shall provide, at a minimum, a 2-pole, 30 Amp, NEMA 3R, lockable service entry rated circuit breaker box located close to the electrical service meter base.
 - a. An E-1 "Simplex Protect Plus" Control Panel shall be externally mounted 1.25 feet above the applicable FEMA Base Flood Elevation in close proximity to the circuit breaker box.

3. All electrical conduit, electrical equipment, and wiring shall be installed by a properly licensed electrician in accordance with applicable electrical codes and subject to District approval.
4. On-site 1.25" HDPE force mains serving individual lots shall be installed as indicated on applicable standard District Detail Drawings from the E-1 AWCS pump assembly to the service connection located at the public roadway right-of-way or as directed by the District.
5. All piping, valves, electrical equipment, wiring, and AWCS equipment shall be inspected and approved by the District prior to the scheduled, coordinated "clear-water" start-up testing of the completed AWCS installation.
6. The services of a qualified E-1 grinder pump technician shall be provided at the start-up at no cost to the District.

15.

SAND, OIL AND GREASE
INTERCEPTOR

Section 15

Sand, Oil and Grease Interceptors

I PREFACE

Chapter 2 Section 2.8.5 of the current James Island Public Service District's (JIPSD) Use and Rate Resolution states, "Grease Traps shall be required for all Customers having food service operations and/or operations which have the capability to produce wastewater containing oil and grease in excess of 100 mg/1, substances which may solidify or become viscous at temperatures between 32 and 150 degrees F or shredded garbage particles greater than one-half (1/2) inch nominal diameter."

Customers shall obtain a District permit prior to installation of Grease Traps, and District inspection and approval shall be obtained prior to discharge into Public Sewers. Grease Trap design and construction shall be as required by applicable building codes and ordinances. All Grease Traps shall be installed and maintained at the Customer's expense.

It is the intent of this James Island Public Service District Grease Trap Standard to provide for specific standards for grease trap location, design, installation, construction, operation and maintenance so as to comply with the above requirements. It should be noted that failure to comply with this Standard shall be considered a violation of applicable sections of the existing Use and Rate Resolution and subject to applicable penalties and/or denial or discontinuance of sewer service.

II. DEFINITIONS

All definitions shall be as currently supplied in the existing JIPSD Use and Rate Resolution with the following additions:

A Food Service Establishment

1. Any commercial facility discharging kitchen or food preparation wastewater including restaurants, motels, hotels, cafeterias, hospitals, schools, bars, etc. and any other facility that in JIPSD's opinion would require a grease trap installation by virtue of its operation. Such definition normally includes any establishment required to have a South Carolina Department of Health and Environmental Control (SC DHEC) food service license.

B. Grease Trap/Grease interceptor

1. The device that is utilized to affect the separation of grease and oils in wastewater effluents from food service establishments. Such traps or interceptors may be of the "outdoor" or underground type normally referred to as large green interceptors, or the "under-the-counter"

package units normally referred to as the smaller grease traps. However, for the purposes of this Standard the words “trap” and “interceptor” are generally used interchangeably.

III. GENERAL REQUIREMENTS

The following administrative operational and other general requirements are applicable to all food service establishments new or existing. Particular requirements for grease trap/interceptor construction specifically pertaining to both new and existing food service establishments can be found in Section IV of this Standard.

- A. All food service establishments in JIPSD’s sewer service area shall have grease handling facilities approved by JIPSD. Establishments whose grease-handling facilities are not in accordance with this Standard shall be given a compliance schedule with a deadline not to exceed three (3) months from the initial notification date.
- B. All food service establishment grease-handling facilities/operations shall be subject to periodic review, evaluation and inspection by JIPSD representatives at any time. Results of inspections will be made available to facility owners with overall ratings assigned and recommendations for corrections/improvement (if necessary) delineated.
- C. The facility receiving three (3) consecutive unsatisfactory evaluations shall be subject to penalties/restrictions provided in the JIPSD Use and Rate Resolution for no compliance with the Resolution’s requirements.
- D. Violations of this JIPSD Grease trap and Grease Interceptor Standard will be considered grounds for discontinuance of sewer service.
- E. Food service establishments whose operations cause or allow excessive grease to discharge or accumulate in the sewer collection system are liable to JIPSD for all costs related to JIPSD service calls for line blockages, line cleanings, line and pump repairs, property damages, etc. including all labor, materials, equipment and overhead. Failure to pay all service –related charges may be grounds for sewer service discontinuance.
- F. Maintenance
 - 1. At the discretion of the JIPSD maintenance contracts and/or records of grease removal frequencies for grease-handling facilities may be required to be submitted periodically to ensure routine and adequate system maintenance.
 - 2. In maintaining grease interceptors the owner(s) shall be responsible for the proper removal and disposal by appropriate means of the captured materials and shall maintain on-site records of the dates and means of

disposal that are subject to review by the JIPSD. Any removal and hauling of the collected materials not performed by owner's personnel must be performed by currently licensed waste disposal firms.

- G. Any food service establishment whose effluent is suspected or perceived by the JIPSD to contain a concentration of greater than 100/mg/l of oil and grease may be required to routinely sample their grease trap effluent have it analyzed for oil and grease at the expense of the owner and furnish a copy of the analysis to JIPSD.
- H. All grease traps/interceptors shall be designed, installed and located in accordance with this Standard to allow for complete access for inspection, maintenance, etc.
- I. All grease traps/interceptors must be installed by properly licensed plumbing contractors.

IV. CONSTRUCTION STANDARDS

A. New Food Service Establishments

1. All newly constructed (or newly located) food service establishments shall be required to install a grease interceptor approved by the JIPSD. Grease interceptors shall be sized at 20 gallons per food service seat and providing not less than 1,000 gallons total capacity (unless such interceptors are not feasible to install).

New food service establishments are to complete an initial grease trap application to install a grease trap and to submit such application with plans, specifications, plumbing diagrams, riser diagrams, etc. to JIPSD for review.

2. All grease trap/interceptor plans and specifications must be reviewed and approved by the JIPSD prior to installation. An approval letter for each new trap will be issued by JIPSD prior to construction and/or installation.
3. The construction and location criteria for grease interceptors shall be in accordance with Environmental Protection Agency (EPA) Guidance Document, "On-site Wastewater Treatment and Disposal Systems".
4. All grease interceptors whether singular or in series must be directly accessible from the surface and must be fitted with an extended outlet sanitary tee that terminates six (6) inches to 12 inches above the tank floor. The minimum access opening dimensions shall be 18 inches x 18 inches or a minimum of 24 inches in diameter. Two access openings (inlet and outlet) to underground traps are required and should be removable with ease by one person.

5. All below ground grease interceptors must either be two-chambered or individual tanks in series. If two-chambered the dividing wall must be equipped with an extended elbow or sanitary tee terminating six (6) inches to 12 inches above the tank floor. An extended outlet sanitary tee must also be provided at the outlet of the second chamber. Both chambers must be directly accessible from the surface.
6. Above criteria (one (1) thru five (5)) apply primarily to outdoor-type (underground) grease trap units.
7. Maintenance of grease traps/interceptors must include thorough pump-out and/or cleaning as needed with a minimum frequency of four (4) times per year. Maintenance contracts may be required to be submitted to the JIPSD as called for in Section III. Paragraph six (6) of this Standard. The owner, however is ultimately responsible for the proper maintenance of the grease trap facility(s).
8. New food service establishments shall not be allowed to initiate operations until appropriate grease-handling facilities are installed and approved by the JIPSD.
9. For cases in which underground-type grease interceptors are not feasible to install new food service establishments will be required to install adequate and approved "under-the-counter" grease traps for use on individual fixtures including pot sinks, mop sinks, pre-rinse sinks, wok ovens and other potential grease-containing drains. In such cases units will be considered acceptable only if approved flow control fittings are provided to the grease interceptor inlet to prevent overloading of the grease trap and to allow for proper interceptor operation.

Approved manufactures included Zurn, Rockford, Thermaco or equal as approved by JIPSD. JIPSD approval of flow control devices and grease trap design must be given prior to installation. Dishwashers and garbage grinders shall not be piped directly to underground-type grease traps without prior JIPSD approval.

B. Existing Food Service Establishments

1. All existing food service establishments (or renovated or expanded establishments) shall have grease-handling facilities approved by JIPSD. Food service establishments without any grease-handling facilities will be given a compliance deadline not to exceed three (3) months from date of notification to have approved and installed grease-handling equipment in compliance with this Standard. Failure to do so will be considered a violation of the existing JIPSD Use and Rate Resolution and will subject the establishment to penalties regarding sewer service discontinuance.

2. For cases in which “outdoor” units are feasible to install construction requirements will be as specified in Section IV (A) of this Standard. i.e., New Facilities.
3. Sizing of “under-the-counter” grease trap units will be in accordance with the EPA recommended ratings for commercial grease traps. The grease retention capacity rating in pounds shall be at least two (2) times the Gallons Per Minute (GPM) flow rate fixture that it serves.
4. Location of “under-the-counter” units must be as close to the source of the wastewater as physically possible while remaining accessible for maintenance.
5. Wastewater from dishwashers and garbage grinders shall not be discharged into grease traps/interceptors unless specifically approved by JIPSD in advance.
6. In maintaining existing grease traps/interceptors the owner(s) shall be responsible for the proper removal and disposal by appropriate means of the captured material and shall maintain records of the dates and means of disposal that are subject to review by the JIPSD.
7. If an existing food service establishment’s grease-handling facilities are either under-designed, substandard or poorly operated the owner(s) will be notified in writing of the required improvements and given a compliance deadline not to exceed three (3) months to comply with the requirements of this Standard.
8. Exclusive use of enzymes or other grease solvents, emulsifiers, etc. in lieu of physical cleaning is not considered acceptable grease trap maintenance practice.
9. Grease-consuming bacteria may be considered for interim approval for grease trap maintenance provided approval is obtained from JIPSD and providing that this control method is considered effective and satisfactory to JIPSD’s inspector. Exclusive use of bacteria (in lieu of physical cleaning) may not be sufficient for long-term grease trap maintenance especially for non-biodegradable waste fractions.

C. New Food Service Establishment in Existing Buildings

1. Where technically feasible, new food service establishments located in existing buildings shall be required to comply with the Grease Trap Standards applicable to new food service establishments, i.e., outdoor-type grease trap units (minimum size 1,000 gallons) shall be installed [Section IV (A)]

2. Where not technically feasible to install “outdoor” units, “under-the-counter” units may be allowed as with existing food service establishment provided prior approval of unit type, size, location, etc. is obtained from the JIPSD. Flow control fittings and/or automatically-cleaned units will be required in all cases. Maintenance contracts and/or clean-out records will also be required [Section IV (B) Numbers 3 thru 8]

V. ENFORCEMENT

Enforcement of this Standard shall be in accordance with the provisions of the most current JIPSD Use and Rate Resolution. Failure to comply with this Standard may be grounds for penalty imposition and /or discontinuance of wastewater service. Additionally, failure to comply may result in notification to the Charleston County Health Department for request of enforcement actions that may lead to revocation of food service permits.

For new food service establishments, JIPSD may elect to request from the appropriate public building official that the Certificates of Occupancy be withheld until compliance with JIPSD’s grease trap requirements are fully satisfied .

16.

FORCE MAINS INTALLED BY
HORIZONTAL DIRECTIONAL DRILLING
(HDD)

SECTION 16

FORCEMAINS INSTALLED BY DIRECTIONAL DRILLING

A. GENERAL

1. Horizontal Directional Drilling (HDD) shall not disturb existing roadways, other adjacent existing utilities, landscaping, hardscape, or miscellaneous utility structures which exist within the limits of construction.
2. All HDPE pipe and fittings shall be as specified in Section 9.B.3.
3. Acquire all HDD force main material from a single, District approved pipe manufacturer.
4. HDD work shall be performed only by trained personnel who have a minimum of three (3) years' experience with horizontal directional drilling (HDD) installations of the size and nature required for the scope-of-work being performed.
 - a. A superintendent with a minimum of five (5) years' experience in horizontal directional drilling techniques and equipment shall be present on the job site on a full-time basis during drilling activities.
5. References documenting the minimum experience requirements for the proposed project shall be submitted for the District's review and approval before commencement of drilling.
6. Acceptance of HDD Force Mains and related Work
 - a. Acceptance will be on the basis of material and workmanship compliance, material tests and inspection of the complete installation. The quality of all materials used, the process of manufacture, and all pipe materials and appurtenances shall be subject to inspection by the District.
 - b. All materials rejected by the District shall be immediately removed from the Project Site.
 - c. Post Pull-Back Hydrostatic Testing and internal TV inspection shall be successfully completed and approved by the District before HDD force mains shall be incorporated into the remainder of the project under construction.

7. Submittals

- a. The pipe manufacturer's certificate shall be submitted to the District indicating all pipe materials and fittings have been inspected and tested of manufacture and meet the requirements specified in Section 9.B.3.
- b. The Project Engineer shall submit detailed pullforce calculations to the District for the single longest HDD installation length required. Calculations shall be prepared in accordance with applicable industry standards and based upon the specific pipe material, diameter, and Dimension Ratio (DR) to be installed. Calculations shall indicate material properties for the applicable pipe material and shall include iterations for both ballasted and empty installations. Calculated pullforces shall not exceed 40% of the maximum 12-hour material tensile strength for the specific pipe material diameter and Dimension Ratio (DR).
- c. The Project Engineer shall submit a planned borepath drawing for each HDD indicating entry and exit angles, length of slope, radius of bends, lengths of arcs, and depth and lengths of level segments under wetlands, waterways, and/or roadways. Similar HDD sections may be submitted as one borepath.
- d. The Project Engineer shall submit a detailed drilling fluid management and disposal plan including a description of equipment required, fluid handling rates and capacities and a detailed description of excess fluid disposal procedures including identification of the disposal site and a letter granting permission for drilling fluid disposal at the identified site.

B. HDD PIPE MATERIALS

1. Pipe shall be Ductile Iron Pipe Size (DIPS) High Density Polyethylene (HDPE) as specified in Section 9.B.3 and as indicated on District approved project.
2. Pipe shall be manufactured of new material meeting all applicable ASTM and AWWA Standards and the material and workmanship requirements of Section 9.B.3 for the pipe material indicated on the approved Drawings.

3. The type, diameter, and grade/class/DR of pipe material to be utilized shall be as specified in Section 9.B.3 unless indicated otherwise on the Drawings.

C. RIGHTS-OF-WAY, EASEMENTS, AND ENCROACHMENT PERMITS

1. Prior to commencing Work, provide the District final, approved copies of all SCDOT rights-of-way and/or local municipal encroachment permits and property easements.
2. Confine limits of Work as required to comply with permit and easement requirements. All encroachments within public rights-of-way beyond permitted limits shall be avoided.
3. HDD force mains shall be installed in strict compliance with all applicable agency permit conditions.

D. HDD FORCE MAIN INSTALLATION

1. General Requirements

- a. Force mains of the indicated sizes, lengths and material requirements shall be directional drilled as indicated on the District approved Drawings. Drill lengths shall not be increased without prior approval by the Project Engineer.
- b. Equipment used to pull pipe shall be documented to be sufficient size for the work.
- c. A suitable cutting head shall be used to bore the face of the excavation. Overcut of the excavation shall be minimized.
- d. The following parameters for the drilling shall not be violated for force mains to be dedicated to the District.
 - 1) Entrance Angle - 15° maximum from horizontal
 - 2) Exit Angle - 15° maximum from horizontal
 - 3) Vertical Entry and Ext Radius of Bend – No less than 150% of the published manufacturer's minimum Radius of Curvature for the pipe material being installed.

2. Joining Pipe

- a. HDPE pipe sections joined by heat fusion shall be joined by thermal butt fusion as follows:

- 1) Both installers and joint inspectors shall be trained by the manufacturer or his authorized representative. The Project Engineer shall provide the District with the name of installers, fusion welders and joint inspectors and applicable documentation indicating appropriate training for each.
 - 2) Butt fusion joining of unlike DR's shall not be permitted. Transition from one DR to another may be accomplished by the use of mechanical couplings or a transition fitting (a short length of the lower DR diameter with one end machined to match the higher DR diameter).
 - 3) Sections of HDPE pipe shall be assembled and heat fusion joined on-site above ground and positioned for continuous, uninterrupted pull-back.
 - 4) All leaking joints shall be repaired or replaced and retested.
 - 5) Initial air pressure testing of completed sections shall be in accordance with Section 16.D.4 below.
- b. HDPE pipe section joined by Ductile Iron fittings of other materials shall be by means of electrofusion Mechanical Joint adaptors complete with flanged connections (flange adapters and back-up rings rated for the same pressure service as the piping) or mechanical compression couplings designed for joining polyethylene pipe to other DIPS piping materials.
- 1) Mechanical couplings shall be installed in accordance with District approved fitting manufacturer's published procedures.
 - 2) All back-up rings, internal ring stiffeners, and fasteners shall be AISI Type 316 stainless steel, except nuts may be AISI Type 304 stainless steel.
3. Layout and Pullback
- a. The full length of pipe to be installed shall be laid out, fusion welded and tested one complete unit before pulled back through the drilled hole. Once started, pipeline pullback shall be continuous.
 - b. Pipe shall be continuously lubricated with a bentonite slurry or other suitable techniques.
 - c. Pipe shall be laid on rollers or other apparatus to facilitate pullback and prevent damage to pipe.

- d. Water Ballasting shall be required as specified in Section 16.D.8 below.

4. Pressure Testing

- a. Carefully inspect each fused pipe string immediately prior to pull-back installation for damage and/or evidence of vandalism which may have occurred after initial air testing. If there is any reason or evidence to suspect that the fused pipe string has been compromised by either damage or vandalism, the entire pipe string shall be air tested again to 5.0 PSI for thirty (30) minutes immediately prior to commencing pull-back installation.
- b. The full-length of each pipeline to be installed shall be air tested at 5.0 PSI for thirty (30) minutes within seventy-two (72) hours before insertion into the drilled hole for pull-back. After successful pull-back installation, each pipeline shall be hydrostatically tested within seventy-two (72) hours after installation as follows:
 - 1) Expansion joints and expansion compensators shall be temporarily restrained, isolated, or removed during pressure testing. The temperature of the test liquid and the pipe test section shall both be stabilized at ambient temperature.
 - 2) Pressure testing may cause unknown material/workmanship flaws to fail by leaking or rupture resulting in catastrophic failure; rupture may result in the sudden, forcible, uncontrolled movement of piping, fittings, and/or ancillary components. Pipe sections and fittings under test shall be restrained against sudden, uncontrolled movement from catastrophic failure. Test equipment shall be examined before pressure is applied to insure all components are tightly connected. Take all applicable precautions to eliminate hazards to personnel near sections being tested. Keep all personnel a safe distance away from test sections during testing.
 - 3) Testing procedures shall conform to applicable requirements of the latest editions of the following standards unless specified otherwise:
 - a) ASME B 31.1 *Power Piping*, Section 137, Pressure Tests
 - b) PPI TR-31, *Underground Installation of Polyolefin Piping*, Section 7, System Testing

- c) *ASTM F 1417, Standard Test Method for Installation Acceptance of Plastic Gravity Sewer Lines Using Low-Pressure Air* (only when this method has been approved in writing by the District)
- 4) The minimum required test pressure of installed pipe shall be 150 psig or 1.5 times the design Shut-Off Head (pressure) specified for the largest pump discharging through the force main network, whichever is greater.
- 5) The total test time including initial pressurization, initial expansion and times at test pressure shall not exceed eight (8) hours before restarting the test. If testing is not completed due to leakage, equipment failure, etc., depressurize the test section for a minimum of eight (8) hours restarting.
- 6) Testing using a hydrostatic medium shall be required utilizing clean, potable water. The test section shall be completely filled with liquid; bleed off all trapped air. Venting at high points to purge trapped air shall be accomplished at air release valves.
- 7) The test procedure shall consist of a separate expansion phase and following test phase. During the initial expansion phase, the test section shall be pressurized to the required test pressure; make-up water shall be added each hour for three (3) hours to return to the test section to the required test pressure. The test phase shall follow immediately for three (3) hours. At the end of the test period, the test section shall be returned to the required test pressure by adding a measured amount of (make-up) water.
- 8) Measured leakage (make-up water) shall not exceed five (5) gallons per inch diameter per mile of HDPE Piping under test per twenty-four (24) hours for the minimum, specified time of three (3) hours. Test pressure drop shall not exceed 15% of the required test pressure over the continuous three (3) hour test period regardless of the amount of make-up required. A pressure drop in excess of 15% or measured make-up water in excess of that allowed shall constitute failure; see Item 5 above for retesting interval.

5. Television Inspection

- a. Immediately following post pull-back hydrostatic pressure testing, all HDD force mains six (6) inch nominal diameter and larger shall be televised and internally inspected for their entire installed length by District approved video equipment and procedures. Video inspection shall be performed immediately after hydrostatic testing and before final tie-in connections are completed.
- b. Provide the District a NASSCO-(PACP) standard video, recorded in MPEG-1 format and written to DVD video, of newly installed HDD force mains utilizing a color, closed-circuit television inspection unit.
- c. Televising shall be observed by the District's inspector and the Project Engineer as the camera progresses through the pipeline. Abnormalities including, but not limited to, buckling, cracked/defected pipe, and failed joints shall be grounds for rejection of the pipeline.
- d. Provide the District a DVD and logs of the televised inspection for review.
- e. The television unit shall have the capability of displaying in color, on DVD, pipe inspection observations such as pipe buckling, excessive deflection, failed joints, and any other relevant physical damage. Each DVD provided to the District shall be permanently labeled with the following:
 - 1) Project Name/Project Number
 - 2) Date of television inspection
 - 3) Station to station location, material, diameter, and length
 - 4) Name of Contractor
 - 5) Date DVD submitted and DVD number
- f. The Project Engineer shall provide the District a line diagram area sketch and written log for each completed pipeline segment of DVD describing the section being televised, camera direction, description and location of failures, pipe condition, weather conditions, and other significant observations
- g. The television inspection equipment shall have an accurate footage counter which displays on the monitor the exact distance of the camera from the center of the starting manhole.

- 1) A camera with rotating and panning lens capabilities shall be required.
 - 2) For all “clear water” ballasted pipelines, lenses shall be capable of providing undistorted, underwater images of internal pipeline attributes. The camera height shall be centered in the pipeline being televised.
 - 3) The speed of the camera through the pipeline shall not exceed 40 feet per minute.
- h. The Contractor shall be required to have all materials, equipment, and labor force necessary to complete all videotaping on the job site prior to beginning videotaping operations.

6. Pipe Location

- a. The actual location of the HDD pipe with respect to proposed line and grade shall be continuously monitored and recorded for as-built document preparation.
 - 1) A “steering head” or other suitable method shall be used to control the line and grade of the pipe to within three (3) feet of indicated line and two (2) feet of indicated grade.
 - 2) A magnetic guidance system shall continually monitor down hole probe location.
 - 3) A secondary locating system shall be established to provide a backup and independent determination of pipeline location comparable to Sharewell’s TruTracker System or approved equal.
- b. The District shall be kept informed of drilling process and allowed to monitor the drilling process and actual pipe location. As-Built information pertaining to the drilling and pipe location shall be provided to the District as the work progresses.
- c. Accurate As-Built location documentation shall be provided to the District after completion of pull-back for approval before final testing and acceptance of the HDD force main by the District.

7. Drilling Fluids and Excavated Material

- a. The ability to remove, transport and dispose of excess drilling fluid shall be sufficient to allow continuous pull-back without interruption

or delays precipitated by the lack of ability to remove drilling fluid from the exit pit.

- b. Drilling fluids and cuttings shall be contained within designated work/construction areas. Excess fluids, cuttings and other related materials shall be disposed of in a legal disposal site in accordance with applicable agency/ municipal regulations. Fluids shall not be allowed to enter existing public storm drainage facilities or flow onto adjacent private property.
- c. All drilling fluids and any additives shall be provided as needed to accomplish the work.
- d. Final, post pull-back clean-up and disposal of all drilling fluids, cuttings and excess materials shall be fully completed as quickly as possible.
- e. Temporary imperviously lined, bermed containment areas may be required within public rights-of-way before construction. Fluid containment areas within public rights-of-way shall be permitted and approved by the applicable regulatory authority before HDD construction. Temporary containment areas shall be fully restored to preconstruction conditions as applicable.

8. Water Ballasting

- a. HDD single pulls of 500 feet or longer and ten (10) inches and larger internal diameter (ID), and/or where steep entry/exit angles are required, or where restrictive subsurface soil conditions are either known or suspected to exist, shall require ballasting with clear, potable water to reduce borehole friction and pull-back loads.
- b. A suitable flexible PE or PVC "fill pipe" of appropriate diameter shall be installed within the full internal length of the pipe being installed, and shall be capable of delivering water at a rate equal to the anticipated rate of pullback.
- c. As the pipe line being installed "breaks" over the entry pit grade, water shall be metered into the pipe being installed to insure that the below grade pipe section shall remain full of water, but without filling the portion of the pipe remaining above grade.

- d. All materials, labor, piping, pumping equipment and clear, potable water required to properly ballast the pipeline during pull-back shall be on-site and available before pull-back commences.
- 9. Damages or Improperly Installed Pipe
 - a. If the pipe is damaged before installation or does not meet the material specifications, it shall be rejected by the District. If the pipe is damaged during installation, placed at the improper grade or line, or cannot be advanced because of an unknown obstruction or any related reason, it shall be abandoned in-place and filled with a District approved grout. After abandoning a pipe, an alternate installation location shall be selected and approved by the District.
 - b. A minimum of five (5) linear feet (minimum) of pipe shall be provided above ground for the purpose of pipe inspection, testing and connection to other force main components.
 - c. Final location As-Built documents shall be provided to the District within three (3) days after pull back is complete.
 - d. End connections to pipe segments installed by directional drilling shall not commence until a minimum of ten (10) consecutive days after pull-back is completed.
- 10. Exit Point Tolerance
 - a. Exit point for the drilled hole shall be within three (3) feet laterally and ten (10) feet longitudinally of where indicated on District approved project Drawings.
 - b. Exception to this requirement will not be allowed unless approved by the District and, if within public rights-of-way, by applicable regulatory authority..

17.

AWCS MATERIALS AND CONSTRUCTION PROCEDURES

SECTION 17

AWCS MATERIALS AND CONSTRUCTION PROCEDURES

A. GENERAL

1. General Description

- a. Furnish and install complete factory-built and tested preassembled, packaged Grinder Pump Stations, each consisting of a simplex grinder pump suitably mounted in a basin constructed of high density polyethylene (HDPE) for simplex stations with dimensions and capacities as approved by the District complete with NEMA 6P electrical quick disconnect (EQD), pump removal system, stainless steel discharge assembly/shut-off valve, anti-siphon valve/check valve, each assembled in the basin with a separate NEMA 4X electrical control/alarm panel and all necessary internal wiring and controls.
- b. All components and materials shall be designed in accordance with Section 14. All motor/grinder pump units shall be of identical type and horsepower unless approved otherwise by the District.

2. Submittals

- a. Furnish a minimum of two (2) Project Engineer approved sets of shop drawings detailing the equipment to be furnished including dimensional data and materials of construction.
- b. Upon District approval of accepted shop drawings, proceed with fabrication of the equipment.

3 Manufacturer

- a. Grinder pump stations, complete with all appurtenances shall be supplied by one grinder pump station manufacturer.
- b. The Contractor shall submit manufacturer supplied detailed installation and user instructions for the grinder pumps, submit evidence of an established service program including complete parts and service manuals.
- c. District approved grinder pump units shall be model DH071-93 as manufactured by Environment One Corporation unless approved otherwise by the District.

4. Operating Conditions

- a. Pumps shall be capable of delivering 15 GPM against a rated total dynamic head of 0 feet (0 PSIG), 11 GPM against a rated total dynamic head of 92 feet (40 PSIG), and 7.8 GPM against a rated total dynamic head of 185 feet (80 PSIG).
- b. Pump shall also be capable of operating at negative total dynamic head without overloading the motor.

5. Warranty

- a. The grinder pump Manufacturer shall provide a part(s) and labor warranty on the complete station and accessories, including, but not limited to, the panel for a period of 24 months after notice of District's acceptance, and 27 months after receipt of shipment.
- b. Any manufacturing defects found during the warranty period will be reported to the Manufacturer by the District and will be corrected by the Manufacturer at no cost to the District.

6. Warranty Performance Certification

- a. A Warranty Performance Certification statement executed by the most senior executive officer of the grinder pump Manufacturer shall be provided to the District certifying a minimum of a 24-month warranty with detailed exclusions from the warranty or additional cost items required to maintain the equipment in warrantable condition, including all associated labor and shipping fees. The Manufacturer shall also certify to bear all costs to correct any original equipment deficiency for the effective period of the warranty.
- b. All preventive maintenance type requirements shall be included in this form as exclusions. These requirements include, but are not limited to, unjamming of grinder mechanism, periodic motor maintenance, and periodic cleaning of liquid level controls.
- c. A performance bond in lieu of the experience clause outlined above may be acceptable to the District, and shall also be used as a criterion to evaluate the Contractor performance over the warranty period.

- d. A Warranty Performance Certification must be completed and submitted to the District prior to final approval for construction.

B. PRODUCT

1. Pump

- a. The pump shall be a custom designed, integral, vertical rotor, motor driven, solids handling pump of the progressing cavity type with a single mechanical seal.
 - 1) Double radial O-ring seals are required at all casting joints.
 - 2) All pump castings shall be cast iron, fully epoxy coated to 8-10 mil Nominal dry thickness, wet applied.
 - 3) The rotor shall be through-hardened, highly polished, precipitation hardened stainless steel.
 - 4) The stator shall be of a specifically compounded ethylene propylene synthetic elastomer suitable for domestic wastewater service. Buna-N is not acceptable as a stator material.

2. Grinder

- a. The grinder shall be placed immediately below the pumping elements and shall be direct-driven by a single, one-piece motor shaft. The grinder impeller (cutter wheel) assembly shall be securely fastened to the pump motor shaft by means of a threaded connection attaching the grinder impeller to the motor shaft.
 - 1) The grinder impeller shall be a one-piece, 4140 cutter wheel of the rotating type with inductively hardened cutter teeth. The cutter teeth shall be inductively hardened to Rockwell 50 – 60c for abrasion resistance.
 - 2) The shredder ring shall be of the stationary type and the material shall be white cast iron. The teeth shall be ground into the material to achieve effective grinding. The shredder ring shall have a staggered tooth pattern with only one edge engaged at a time, maximizing the cutting torque.
- b. The grinder assembly shall be dynamically balanced and operate without objectionable noise or vibration over the entire range of recommended operating pressures and constructed to minimize clogging and jamming under all normal operating conditions

including starting. Sufficient vortex action shall be created to scour the tank free of deposits or sludge banks.

- c. The grinder shall be positioned in such a way that solids are fed in an upward flow direction. The maximum flow rate through the cutting mechanism must not exceed 4 feet per second.
 - 1) The inlet shroud shall have a diameter of no less than 5 inches.
 - 2) The impeller mechanism shall rotate at a nominal speed of no greater than 1800 rpm.
- d. The grinder shall be capable of reducing all components in normal domestic sewage, including a reasonable amount of "foreign objects," such as paper, wood, plastic, glass, wipes and rubber into finely-divided particles to pass freely through the passages of the pump and the 1-1/4" diameter stainless steel discharge piping.

3. Electric Motor

- a. The pump motor shall be a 1 HP, 1725 RPM, 240 Volt (unless approved otherwise by the District) 60 Hz, 1 Phase, capacitor start, ball bearing, air-cooled induction type with Class F installation, low starting current not to exceed 30 amperes and high starting torque of 8.4 foot pounds.
- b. The pump motor shall be press-fit into the casting for better heat transfer and longer winding life. Inherent protection against running overloads or locked rotor conditions for the pump motor shall be provided by the use of an automatic-reset, integral thermal overload protector incorporated into the motor.

4. Mechanical Seal

- a. The pump/core shall be provided with a mechanical shaft seal to prevent leakage between the motor and pump.
- b. The seal shall have a stationary ceramic seat and carbon rotating surface with faces precision lapped and held in position by a stainless steel spring.

5. Tank and Integral Accessway.
- a. The tank shall be a Wetwell/Drywell design made of high density polyethylene. Corrugated sections shall be a double wall construction with the internal wall being generally smooth to promote scouring.
 - b. All seams created during tank construction are to be thermally welded and factory tested for leak tightness. The tank wall and bottom shall be designed to withstand the pressure exerted by saturated soil loading at maximum burial depth. All station components must function normally when exposed to 150 percent of the maximum external soil and hydrostatic pressure.
 - c. The tank shall be furnished with one EPDM grommet fitting to accept a 4.50" OD DWV or Schedule 40 pipe.
 - d. The Drywell access way shall be an integral extension of the Wetwell assembly and shall include a lockable cover assembly providing low profile mounting and watertight capability. The accessway design and construction shall enable field adjustment of the station height in increments of 4" or less without the use of any adhesives or sealants requiring cure time before installation can be completed.
 - e. The station shall have all necessary penetrations molded in and factory sealed. To ensure a leak free installation no field penetrations will be acceptable.
 - f. All discharge piping shall be constructed of 304 stainless steel. The discharge shall terminate outside the accessway bulkhead with a stainless steel, 1-1/4" Female NPT fitting. The discharge piping shall include a stainless steel ball valve rated for 235 psi WOG; PVC ball valves or brass ball/gate will not be accepted. The bulkhead penetration shall be factory installed and warranted by the manufacturer to be watertight.
 - g. The accessway shall include a single NEMA 6P Electrical Quick Disconnect (EQD) for all power and control functions, factory installed with accessway penetrations warranted by the manufacturer to be watertight.

- 1) The EQD will be supplied with Electrical Supply Cable (ESC) of the length required for each required installation outside the station, to connect to the alarm panel. The ESC shall be installed in the basin by the manufacturer.
- 2) The EQD shall require no tools for connecting, seal against water before the electrical connection is made, and include radial seals to assure a watertight seal regardless of tightening torque.
- 3) The EQD shall be so designed to be conducive to field wiring as required. The accessway shall also include an integral 2-inch vent to prevent sewage gases from accumulating in the tank.

6. Check Valve

- a. The pump discharge shall be equipped with a factory installed, gravity operated, flapper-type integral check valve built into the stainless steel discharge piping to provide a full-ported passageway when open, and shall introduce a friction loss of less than 6 inches of water at maximum rated flow.
- b. Moving parts shall be made of a 300 Series stainless steel and fabric reinforced synthetic elastomer to ensure corrosion resistance, dimensional stability, and fatigue strength.
- c. A nonmetallic hinge shall be an integral part of the flapper assembly providing a maximum degree of freedom to assure seating even at a very low back-pressure.
- d. The valve body shall be an injection molded part made of an engineered thermoplastic resin and rated for continuous operating pressure of 235 psi.

7. Anti-Siphon Valve

- a. The pump discharge shall be equipped with a factory-installed, gravity-operated, flapper-type integral anti-siphon valve built into the stainless steel discharge piping. Moving parts shall be made of 300 Series stainless steel and fabric-reinforced synthetic elastomer to ensure corrosion resistance, dimensional stability, and fatigue strength. A nonmetallic hinge shall be an integral part of the flapper assembly.

- b. The valve body shall be injection-molded from an engineered thermoplastic resin.
 - c. The anti-siphon port diameter shall be no less than 60% of the inside diameter of the pump discharge piping.
- 8. Core Unit
 - a. The grinder pump station shall have a cartridge type, easily removable core assembly consisting of pump, motor, grinder, all motor controls, check valve, anti-siphon valve, level controls, electrical quick disconnect and wiring. The core unit shall be installed in the basin by the Manufacturer.
 - b. The core unit shall seal to the tank deck with a stainless steel latch assembly. The latch assembly must be actuated utilizing a single quick release mechanism requiring no more than a half turn of a wrench.
 - c. The watertight integrity of each core unit shall be established by a 100 percent factory test at a minimum of 5 PSIG.
- 9. Controls
 - a. All necessary motor starting controls shall be located in the cast iron enclosure of the core unit secured by stainless steel fasteners. The wastewater level sensing controls shall be housed in a separate enclosure from motor starting controls.
 - b. The level sensor housing shall be sealed via a radial type seal. The level sensing control housing shall be integrally attached to pump assembly.
 - c. The level sensing housing shall be a high-impact thermoplastic copolymer over-molded with a thermo plastic elastomer.
 - d. All fasteners throughout the assembly shall be 300 Series stainless steel. Closure of the high-level sensing device shall energize an alarm circuit as well as a redundant pump-on circuit.
 - e. Each core shall be equipped with a factory installed equalizer diaphragm that compensates for any atmospheric pressure or temperature changes.

- f. The grinder pump will be furnished with a 6 conductor 14 gauge, type SJOW cable, pre-wired and watertight to meet UL requirements with a factory installed NEMA 6P EQD half attached to it.

10. Control Panel

- a. Each grinder pump station shall include a NEMA 4X, UL-listed E-1 "Simplex Protect Plus" control panel suitable for wall or pole mounting. The NEMA 4X enclosure shall be manufactured of thermoplastic polyester to ensure corrosion resistance. The enclosure shall include a hinged, lockable cover with padlock, preventing access to electrical components, and creating a secured safety front to allow access only to authorized personnel. The enclosure shall not exceed 10.5" W x 14" H x 7" D, or 12.5" W x 16" H x 7.5" D if certain options are included.
- b. The control panel shall contain one 15-amp, double-pole circuit breaker for the pump core's power circuit and one 15-amp, single-pole circuit breaker for the alarm circuit. The panel shall contain a push-to-run feature, an internal run indicator, and a complete alarm circuit. All circuit boards in the alarm panel are to be protected with a conformal coating on both sides and the AC power circuit shall include an auto resetting fuse.
- c. The control panel shall include the following features: external audible and visual alarm; push-to-run switch; push-to-silence switch; redundant pump start; and high level alarm capability. The alarm sequence is to be as follows when the pump and alarm breakers are on:
 - 1) When liquid level in the sewage wet-well rises above the alarm level, the contacts on the alarm pressure switch activate, audible and visual alarms are activated, and the redundant pump starting system is energized.
 - 2) The audible alarm may be silenced by means of the externally mounted, push-to-silence button.
 - 3) Visual alarm remains illuminated until the sewage level in the wet-well drops below the "off" setting of the alarm pressure switch.

- d. The visual alarm lamp shall be inside a red, oblong lens at least 3.75" L x 2.38" W x 1.5" H. Visual alarm shall be mounted to the top of the enclosure in such a manner as to maintain NEMA 4X rating.
- e. The audible alarm shall be externally mounted on the bottom of the enclosure, capable of 93 dB @ 2 feet. The audible alarm shall be capable of being deactivated by depressing a push-type switch that is encapsulated in a weatherproof silicone boot and mounted on the bottom of the enclosure (push-to-silence button).
- f. The control panel, as manufactured shall include the following equipment:
 - 1) Generator Receptacle and Auto Transfer – The alarm panel shall include a 20 amp, 250 VAC generator receptacle with a spring-loaded, gasketed cover suitably mounted to provide access for connection of an external generator while maintaining a NEMA 4X rating.
 - 2) An automatic transfer switch shall be provided, which automatically switches from AC power to generator power.
 - 3) Power shall be provided to that control panel through the generator receptacle whenever power is present at the receptacle, allowing the audible and visual alarms to function normally in generator mode.

11. Serviceability

- a. The grinder pump core, including level sensor assembly, shall have two lifting hooks complete with lift-out harness connected to its top housing to facilitate easy core removal when necessary.
- b. Each EQD half shall include a water-tight cover to protect the internal electrical pins while the EQD is unplugged. A pump push-to-run feature will be provided for field trouble shooting.
- c. The push-to-run feature shall operate the pump even if the level sensor assembly has been removed from the pump assembly.
- d. Motor control components shall be mounted on a readily replaceable bracket for ease of field service.

12. Safety

- a. The grinder pump shall be free from electrical and fire hazards as required in a residential environment.
- b. The completely assembled and wired grinder pump station shall be listed by Underwriters Laboratories, Inc. and appropriate for the intended use.
- c. The grinder pump shall meet accepted standards for plumbing equipment for use in or near residences, shall be free from noise, odor, or health hazards.
- d. The grinder pump shall bear the seal of NSF International. Third-party testing to NSF standard is not acceptable.

C. EXECUTION

1. Factory Test

- a. Each grinder pump shall be submerged and operated for 1.5 minutes (minimum). Included in this procedure will be the testing of all ancillary components such as, the anti-siphon valve, check valve, discharge assembly and each unit's dedicated level controls and motor controls.
 - 1) All factory tests shall incorporate each of the above listed items.
 - 2) Actual appurtenances and controls which will be installed in the field shall be particular to the tested pump only.
- b. Certified test results shall be available upon request showing the operation of each grinder pump at two different points on its curve.
- c. Additional validation tests include: integral level control performance, continuity to ground and acoustic tests of the rotating components.

2. Certified Service Program

- a. The grinder pump Manufacturer shall provide a program implemented by the Manufacturer's personnel as described in this specification to certify the service company as an authorized serviced center.

- b. The Manufacturer's Service program shall include, as a minimum:
 - 1) Pump Population Information — The service company shall maintain a detailed database for the grinder pumps in the territory that tracks serial numbers by address.
 - 2) Inventory Management — The service company shall maintain an appropriate level of inventory (pumps, tanks, panels, service parts, etc.) including regular inventory review and proper inventory labeling. Service technicians shall maintain appropriate parts inventory and spare core(s) on service vehicles.
 - 3) Service Personnel Certification — Service technicians shall maintain their level-specific certification annually.
 - 4) Service Documentation and Records — Start up sheets, service call records, and customer feedback will be recorded and available by the service company.
 - 5) Shop Organization — The service company shall keep its service shop organized and pumps will be tagged with site information at all times. The shop will have all required equipment, a test tank, and cleaning tools necessary to service pumps properly.

3. Delivery

- a. All grinder pump units will be delivered to the job site 100 percent completely assembled, including testing, ready for installation.

4. Installation

- a. Earth excavation and backfill are specified elsewhere and as indicated on the Drawings.
- b. Work under this section shall include any necessary sheeting and bracing.
 - 1) Control all ground water to provide a firm, dry subgrade for the structure, and shall guard against flotation or other damage resulting from general water or flooding.
 - 2) The grinder pump stations shall not be set into the excavation until the installation procedures and excavation have been approved by the District.

- c. Remove packing material. User's instructions shall be provided to the District for each unit. Hardware supplied with the unit, if required, will be used at installation. The basin will be supplied with a standard 4" inlet grommet (4.50" OD) for connecting the incoming sewer line. Appropriate inlet piping must be used. The basin may not be dropped, rolled or laid on its side for any reason.
- d. Installation shall be accomplished so that 3" to 6" of access way, below the bottom of the lid, extends above the finished grade line. The finished grade shall slope away from the unit. The diameter of the excavated hole must be large enough to allow for the concrete anti-flotation collar.
- e. A 6" inch (minimum) layer of SCDOT No. 789 granite aggregate shall be used as bedding material under each unit.
- f. A concrete anti-flotation collar shall be required and shall be pre-cast to the grinder pump or poured in place.
 - 1) If precast, each grinder pump station pre fitted with a pre-cast anti-flotation collar shall have a minimum of three lifting eyes for loading and unloading purposes.
 - 2) If the concrete is poured in place, the unit shall be leveled, and filled with water, to the bottom of the inlet, to help prevent the unit from shifting while the concrete is being poured. Concrete shall be manually vibrated to ensure there are no voids.
- g. Furnish and install all 4-inch SCH 40 PVC pipe for connection to the influent wastewater service line.
- h. The electrical enclosure shall be furnished, installed and wired to the grinder pump station to provide a complete operable unit. Alarm devices shall be mounted on the Control Panel or as specified elsewhere. Coordinate the optimum location for the Control Panel and mount the alarm device in a conspicuous, District approved, readily accessible exterior location, pursuant to applicable national and local codes.
 - 1) The control panel shall be connected to the grinder pump station by a length of 6-conductor type TC cable as shown on the District approved shop drawings. The power and alarm circuits shall be on separate power circuits.

- 2) The grinder pump stations will be provided with electrical supply cable of the required length to connect the station to the control panel. This cable shall be supplied with a factory installed EQD half to connect to the mating EQD half on the core.

5. Backfill Requirements

- a. The method of backfilling shall surround the unit to grade using Class I or Class II backfill material as defined in ASTM 2321 latest revision.
- b. Backfill shall be compacted in lifts not to exceed one foot to reach a minimum Modified Proctor Density of 90 percent.
- c. District approved backfill material shall be thoroughly compacted in lifts not exceeding 12". The finish grade line shall be 3" to 6" below the bottom of the lid, and final grade shall slope away from the grinder pump station.
- d. Each residential AWCS installation shall be complete in all respects, including, but not limited to, repairs and/or replacement of sidewalks, driveways, landscaping, sodding and seeding, and restoration of hardscape damaged by construction.

6. Start-Up and Field Testing

- a. The pump Manufacturer shall provide the services of qualified factory trained technician(s) who shall inspect the placement and wiring of each station, perform field tests as specified herein, and instruct District personnel in the operation and maintenance of the equipment before the stations are accepted by the District.
- b. All equipment and materials necessary to perform testing shall include, at a minimum, a portable generator and power cable (if temporary power is required), "clear water" shall be provided sufficient in quantity for all functional test requirements (filled to a depth sufficient to verify the high level alarm is operating), and opening of all valves in the system. These steps shall be completed prior to the qualified factory trained technicians arrival on site.
- c. The services of a trained factory-authorized technician shall be provided for two (2) hours minimum for each AWCS installation.

- d. Upon completion of the installation, the authorized factory technician shall perform the following test on each station in the presence of District personnel:
 - 1) Confirm that the discharge shut-off valve in the station is fully open.
 - 2) Turn ON the alarm power circuit and verify the alarm is functioning properly.
 - 3) Turn ON the pump power circuit. Initiate the pump operation to verify automatic “on/off” controls are operative. The pump should immediately turn ON.
 - 4) Consult the pump Manufacturer’s Service Manual for detailed start-up procedures.
- e. Upon completion of the start-up and testing, the Manufacturer shall submit to the District the start-up authorization form for each separate AWCS installation describing the results of the tests performed for each grinder pump station.
 - 1) Final acceptance of the system by the District shall not occur until authorization forms have been received for each pump station installed and any installation deficiencies corrected.
 - 2) The occupants of each residential unit or commercial property sewered by an individual AWCS installation shall be thoroughly briefed regarding the operational characteristics of the installation and provided with District approved contact information for 24/7 District personnel responsible in the event of failure of the AWCS pumping unit.

18.

JIPSD CLOSEOUT DOCUMENTS

SECTION 18

JIPSD CLOSEOUT DOCUMENTS

- A. AFFIDAVIT OF TITLE
- B. AFFIDAVIT OF PROPERTY TRANSFER FEE (IF APPLICABLE)
- C. BILL OF SALE
- D. CONTRACTOR GUARANTY AND WARRANTY
- E. CONTRACTOR'S AFFIDAVIT AND FINAL WAIVER OF LIEN
- F. GRANT OF PERPETUAL AND CONSTRUCTION EASEMENT
- G. JIPSD PROJECT COMPLETION ENGINEER QUESTIONNAIRE
- H. MAINTENANCE OF AGREEMENT SEWER
- I. TITLE TO REAL ESTATE (IF APPLICABLE)

AFFIDAVIT OF TITLE

_____, being duly sworn,

1. That _____, a duly organized corporation under the laws of the State of South Carolina, is the sole owner of the property described in the Bill of Sale to which this Affidavit is attached and that it is the same entity which executed the Bill of Sale to which this Affidavit is attached.

By: _____

SWORN to before me this _____ day of _____, 20____.

_____(SEAL)

My Commission Expires:_____

STATE OF SOUTH CAROLINA)
)
COUNTY OF CHARLESTON) AFFIDAVIT

PERSONALLY appeared before me the undersigned, who being duly sworn, deposes and says:

1. I have read the information on this Affidavit and I understand such information.
2. The property is being transferred by _____ to the James Island Public Service District on _____, 20____.
3. Check one of the following: The DEED is
 - (a)_____ subject to the deed recording fee as a transfer for consideration paid or to be paid in money or money's worth.
 - (b)_____ subject to the deed recording fee as a transfer between a corporation, a partnership, or other entity and a stockholder, partner, or owner of the entity, or is a transfer to a trust or as distribution to a trust beneficiary.
 - (c)_____ EXEMPT from the deed recording fee because (exemption #____) Explanation if required, (If exempt, please skip items 4-6, and go to item 8 on this affidavit).
4. Check one of the following if either item 3(a) or item 3(b) above has been checked.
 - (a)_____ The fee is computed on the consideration paid or to be paid in money or money's worth in the amount of \$_____.
 - (b)_____ The fee is computed on the fair market value of the realty which is \$_____.
 - (c)_____ The fee is computed on the fair market value of the realty as established for property tax purposes which is \$_____.
5. Check YES _____ or NO _____ to the following: A lien of encumbrance existed on the land, tenement, or realty before the transfer and remained on the land, tenement, or realty after the transfer. If "YES", the amount of the outstanding balance of this lien or encumbrance is (\$_____).
6. The DEED Recording Fee is computed as follows:

(a)\$_____ the amount listed in item 4 above.

(b)\$_____ the amount listed in item 5 above (no amount place zero).

(c)\$_____ Subtract Line 6(b) from Line 6(a) and place the result.

7. As required by Code Section 12-24-70, I state that I am a responsible person who was connected with the transaction as: Grantor, Grantee or Legal Representative.
8. I understand that a person required to furnish this affidavit who willfully furnishes a false or fraudulent affidavit is guilty of a misdemeanor and, upon conviction, must be fined not more than one thousand dollars or imprisoned not more than one year, or both.

Grantor, Grantee, or Legal Representative
connected with this transaction (sign here)

Sworn to before me this _____ day
of _____, 20____.

(Print or Type name here)

Notary Public for South Carolina
My Commission Expires:_____
(NOTARY AFFIX SEAL)

STATE OF SOUTH CAROLINA)
) BILL OF SALE
COUNTY OF CHARLESTON)

KNOW ALL MEN BY THESE PRESENTS, that _____
for and in consideration of the sum of _____ and other valuable consideration, to
it in hand paid, at and before the sealing and delivery of these presents by the James Island
Public Service District (“District”), the receipt of which is hereby acknowledged, have bargained
and sold, and by these Presents do bargain, sell and deliver to the said District, the following
described property, to-wit:

All pipes, manholes, and appurtenances associated with the sanitary sewer system
installed at Seller’s expense within those areas designated as “Sewer Easements” or located
within the right-of-ways of any street on the plat of _____ by
_____, dated _____, and all other installed sanitary
sewer system components installed subsequent to the date of said plat, through this date.

To have and to hold the same unto the said District, its successors and assigns forever.

And the Seller does hereby bind its successors, heirs, and assigns, to warrant and forever
defend all and singular the said bargained property unto the said District, its successors, heirs,
and assigns, against Seller and its successors, heirs and assigns and all persons lawfully claiming
or to claim the same, or any part thereof.

IN WITNESS WHEREOF Seller has hereunto set its hand and seal on the _____ day of
_____, 20____.

Sealed and Delivered in the Presence of:

_____ By: _____
Witness

Witness

SWORN to before me this _____ day of
_____, 20____.

Notary Public for: _____
My Commission Expires: _____

CONTRACTOR GUARANTY

WHEREAS, the James Island Public Service District Commission (herein called the District), as ultimate Owner and operator of the _____ (project name) wastewater facilities located on _____ (street address, lot and block or tract) requires tangible assurance as to the quality of materials and workmanship used on the aforementioned project; and

WHEREAS, _____ (Contractor), as the duly licensed and responsible contractor having constructed and/or supervised the construction of the aforementioned project, desires to assure the District that the quality of materials and workmanship meet applicable regulatory agency and District standards, plans and specifications, and requirements governing the construction of such utilities.

THEREFORE, it is hereby agreed that neither final payment for the work, nor any provision in the contract with the Developer, and no partial or entire use of the constructed utility improvements by the District or the public shall constitute an acceptance of work not performed in accordance with approved plans, specifications, standards or requirements, or relieve the Contractor of liability or responsibility for faulty materials or workmanship. It is further agreed that the Contractor shall promptly remedy any defects in the work, with the exception of damages construed as acts of God, at his own expense, and pay for any damage to other work resulting therefrom which shall appear within a period of twenty-four (24) months from the date of acceptance, subject to the guaranty conditions expressed here, of the wastewater facilities by the District.

IN WITNESS WHEREOF, this instrument of GENERAL GUARANTY is hereby executed.
(Signatures on next page)

Attest: _____
(Authorized Signature of Contractor)

For: _____
(Company Name)

(Address)

SWORN to before me this ____ day of
_____, 20____.

_____(SEAL)

Notary Public for South Carolina

My Commission Expires:_____

JAMES ISLAND PUBLIC SERVICE DISTRICT

CONTRACTOR'S AFFIDAVIT AND FINAL WAIVER OF LIEN

PROJECT: _____

DATE: _____

TO: JAMES ISLAND PUBLIC SERVICE DISTRICT

FROM: _____
(Contractor)

STATE OF: _____

COUNTY OF: _____

I, _____, the _____ of
(Title of Officer)

(Name of Company)

DO HEREBY CERTIFY that all persons who have performed labor or rendered services, all subcontractors, and all persons, firms or corporations, including material, men and third persons and their sources of supply, furnishing work, labor, services, supplies, material or any other items to the company, used in connection with _____ have been paid in full for same.

I FURTHER CERTIFY that all Social Security, Unemployment Insurance and other insurances and all Federal, State and Local Taxes and Fees have been paid in full to date, and that a proper Reserve has been set up for their future payment.

I FURTHER CERTIFY that all claims or sums due for any reason on account of the above mentioned work have been paid or satisfied.

I FURTHER CERTIFY that all of the foregoing work has been properly completed in accordance with the plan and specifications governing the said work, and in accordance with all authorities having jurisdiction over said work.

TOTAL RECEIVED to date is \$ _____. Total payment due \$ _____.
This release of lien and claim is not valid until the above payment is received.

I FURTHER RELEASE JAMES ISLAND PUBLIC SERVICE DISTRICT, its officers, agents, and

employees, and Owner(s) from any and all claims arising under or by virtue of said contract or any modification of change thereof.

IN WITNESS WHEREOF, I have hereunto affixed my signature this _____ day of _____, 20____.

(NAME OF COMPANY)

(SIGNATURE OF OFFICER)

SWORN to before me this ____ day
of _____, 20____.

NOTARY PUBLIC FOR SOUTH CAROLINA
My Commission Expires:_____

STATE OF SOUTH CAROLINA)
)
COUNTY OF CHARLESTON) GRANT OF PERPETUAL AND
CONSTRUCTION EASEMENT

WHEREAS, the JAMES ISLAND PUBLIC SERVICE DISTRICT (hereinafter called the District) is a body politic and corporate under the laws of the State of South Carolina and requires the easements hereinafter described and granted in connection with the construction of wastewater collection and transmission facilities; and

WHEREAS, the _____ (hereinafter called the Grantor) is minded to grant such easement to the District for the consideration and upon the terms and conditions hereinafter set forth.

NOW, THEREFORE, KNOW ALL MEN BY THESE PRESENTS that the Grantor, in consideration of the sum of \$_____ to him in hand paid for the perpetual easement granted hereunder and in further consideration of the sum of \$_____ to him in hand paid for the additional easement during construction granted hereunder, at and before the sealing and delivery of these presents, by the District, the receipt whereof is hereby acknowledged, has granted, bargained, sold and released and by these presents does grant, bargain, sell and release unto the District, its successors and assigns forever, the following easement:

1. A perpetual easement for the construction, location, installation, operation, maintenance, repair and replacement of wastewater facilities over, under and upon the following described property:

TOGETHER with the right of ingress into and egress therefrom over and upon the

remaining property of the Grantor.

2. An additional easement during the construction of the said wastewater facilities over, under and upon area more fully described as follows:

The easement during construction shall exist during construction and will continue until one (1) year after the date that the aforesaid wastewater facilities have been accepted by the District.

IT IS UNDERSTOOD AND AGREED that the easement above described is granted and accepted upon the following terms and conditions, to wit:

(a) The Grantor will make no use of the area occupied by said easements which is inconsistent with the uses and the purposes for which the easements have been granted, and without limiting the generality of this provision, the Grantor agrees that no permanent structures such as buildings, sheds and other structures shall be placed upon the easement area described in paragraph 1 at any time, nor upon the easement area described in paragraph 2 until such time as construction has been completed and until one (1) year after the aforesaid wastewater facilities have been accepted by the District.

(b) The District agrees that upon the completion of the construction aforesaid, it will promptly restore the surface of the area described in easement number 2, to the extent practicable, by leveling and rough grading the surface; but nothing herein contained shall be construed to require the District to replace any shrubbery or trees unless specifically delineated as follows:

(c) The District agrees that upon completion of construction, the surface of the area described in easement number 1 will, to the extent practicable, be leveled and rough graded, and further that, in the event that it becomes necessary in the future to disturb the surface, in order to effect maintenance, repair or replacement, it will to the extent practicable level and rough grade the surface, but nothing herein contained shall be constructed to require the District to replace any shrubbery or trees unless specifically delineated as follows:

TO HAVE AND TO HOLD, all singular, the easement rights and privileges above described unto the JAMES ISLAND PUBLIC SERVICE DISTRICT COMMISSION, its successors and assigns.

And the Grantor does hereby bind himself and his successors, heirs, administrators and executors to warrant and forever defend all and singular the said premises unto the said JAMES ISLAND PUBLIC SERVICE DISTRICT, its successors and assigns every person whomsoever lawfully claiming or to claim the same or any part thereof.

IN WITNESS WHEREOF, the Grantor has hereunto set his Hand and Seal, this _____ day of _____, 20____.

WITNESS:

(SEAL)

By: _____

Its _____

[illegible]

PERSONALLY appeared before me the undersigned witness and made oath that (s)he saw the within named _____ by _____, its sign seal and as his act and deed, deliver the within written instrument: and that (s)he with the other witness witnessed the execution and delivery thereof.

SWORN to before me this ____ day
of _____, 20____.

Notary Public of South Carolina
My Commission Expires: _____

JIPSD PROJECT COMPLETION ENGINEER QUESTIONNAIRE

Project Name:
TMS #:
Contractor:
SCDHEC Permit #:
Number Lots Served:
Number of Services Available:

No. of Standard Manholes	
No. of Drop Manholes	
No. of Air Valves	

Total cost of construction of the sanitary sewer system is: \$_____

Size of Sanitary Sewer	Number of Feet

Size of Pumps	Force Main	Number of Feet

Is there a pump station? Yes No If yes, value? \$_____

Is there industrial waste from this project? Yes No

Is there hazardous waste from this project? Yes No

Signature of Engineer: _____ Date: _____

MAINTENANCE AGREEMENT SEWER

We, the undersigned, _____, as owners of _____ agree to guarantee on behalf of the James Island Public Service District ("District"), that any deficiencies found within the said development will be repaired at the developer's expense for the period of two years from the final acceptance of said project.

Now, therefore, the condition of this obligation is such that _____ shall make good all defects appearing in the work performed installing the sanitary sewer system for said project. Defects shall be defined as faulty workmanship or materials which may develop during the period of two years from _____, the date of conveyance and final acceptance of said work. Should the above conditions be met, this agreement shall be null and void.

The District shall notify the developer of defective work requiring immediate repair. If the defective work is not corrected within seven (7) days of the developer's receipt of this notification, the District has the right to Hold or Cancel the installation of future services within the development or invoice the said developer for all costs associated in the necessary repairs, in order to bring the said installed sanitary sewer system to the standards of the District. Said invoice shall be due and payable 30 days upon receipt of invoice.

Signed this _____ day of _____, 20____.

By: _____

Witness

Its: _____

Witness

SWORN to before me this _____ day of
_____, 20____.

Notary Public for _____

My Commission Expires: _____

TITLE TO REAL ESTATE

18-17

_____ L.S.

(1) Signature of Witness

_____ L.S.

(2) Signature of Witness

_____ L.S.

STATE OF _____)

)

ACKNOWLEDGMENT

COUNTY OF _____)

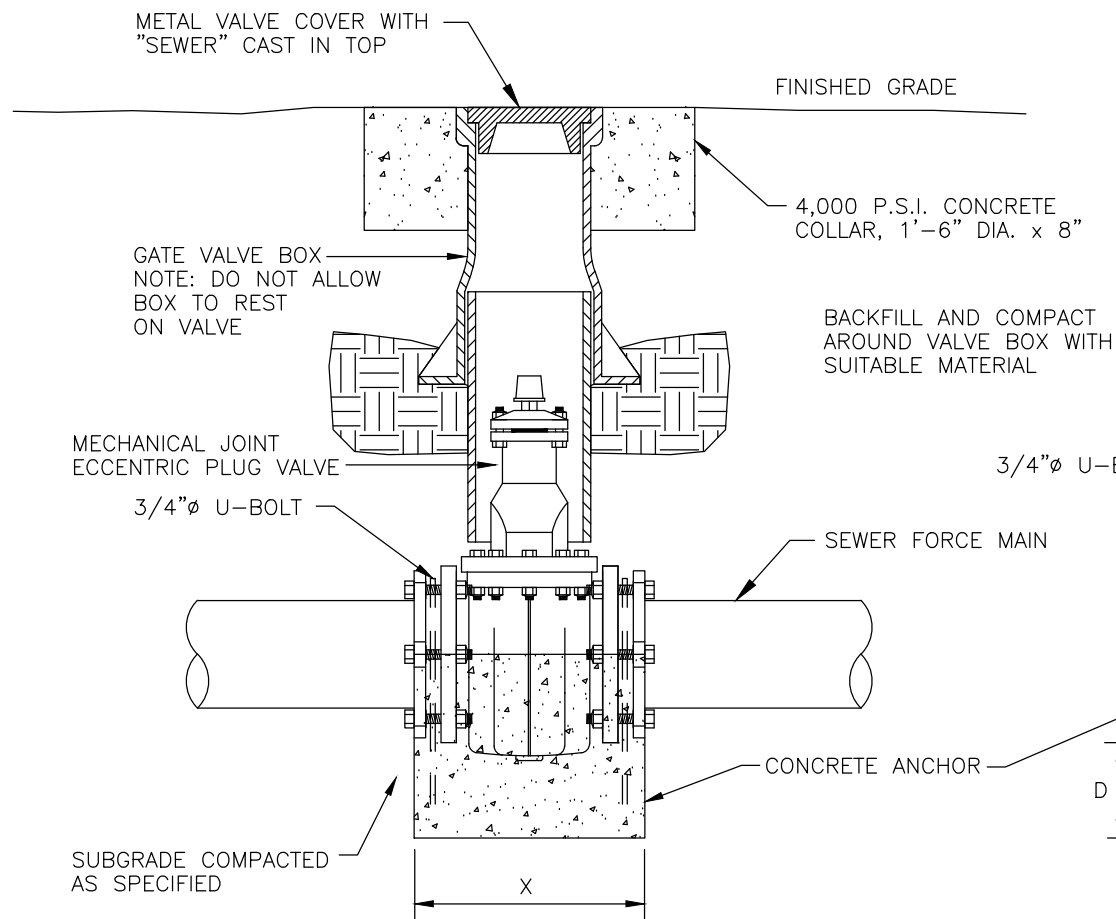
I, _____ Notary Public for the State of _____, do
hereby certify that **GRANTOR'S NAME**, by _____ its
_____, personally appeared before me this day and acknowledged the due
execution of the foregoing instrument.

SWORN to before me this _____ day
of _____, 20____.

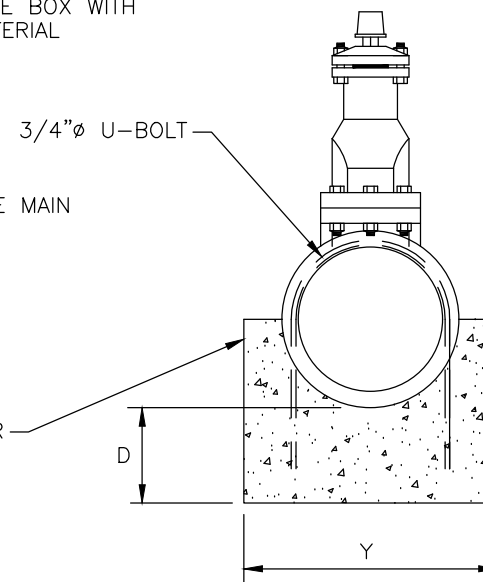
NOTARY PUBLIC FOR SOUTH CAROLINA
My Commission Expires:_____

19.

STANDARD DRAWINGS



ANCHORAGE SCHEDULE				
VALVE	SQ. FT.	"D"	"X"	"Y"
3"Ø	0.3	7.5"	4"	9"
4"Ø	0.4	9"	5"	11"
6"Ø	0.8	13"	7"	16"
8"Ø	1.2	17"	8"	21"



NOTICE:
ALL PLUG VALVES 4" DIAMETER
AND LARGER SHALL BE GEAR OPERATED

NOTICE:
SEE DISTRICT STANDARDS,
SECTION 8D & 12E FOR
ADDITIONAL REQUIREMENTS

JAMES ISLAND PUBLIC SERVICE DISTRICT

VALVE AND VALVE BOX

DRAWING:

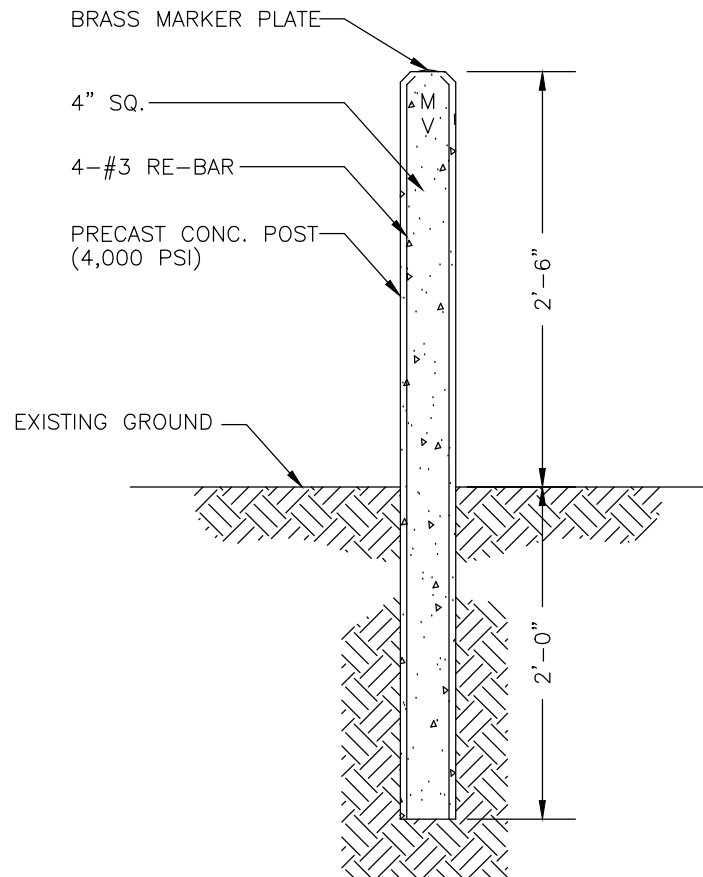
1

DATE: 05/24/16

DRAWN BY: GRC & ASSOC., INC

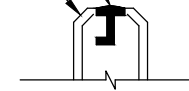
SCALE: NTS

APPROVED BY: DJH



2" BRASS MARKER
PLATE W/ ANCHOR

3/4" CHAMFER @
EACH CORNER



NOTE:
MAIN LINE VALVE MARKERS SHALL BE
PAINTED AS FOLLOWS:
FEDERAL SAFETY GREEN (SEWER LINES)
AND MARKED AS FOLLOWS:
MV - MAIN VALVE
AV - AIR RELEASE VALVE



FEDERAL SAFETY GREEN (SEWER LINES)
AND MARKED AS FOLLOWS:
MV - MAIN VALVE
AV - AIR RELEASE VALVE

JAMES ISLAND PUBLIC SERVICE DISTRICT

CONCRETE VALVE MARKER

DRAWING:

2

DATE: 05/24/16

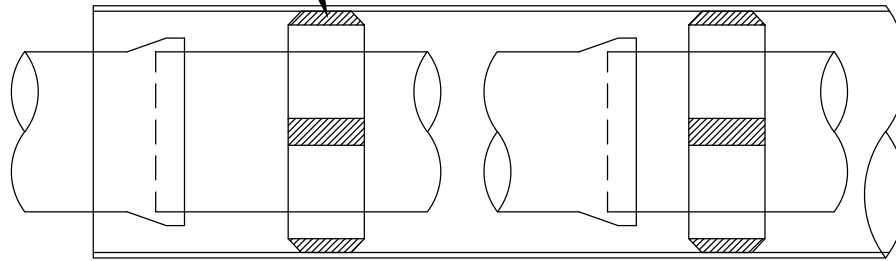
DRAWN BY: GRC & ASSOC., INC

SCALE: NTS

APPROVED BY: DJH

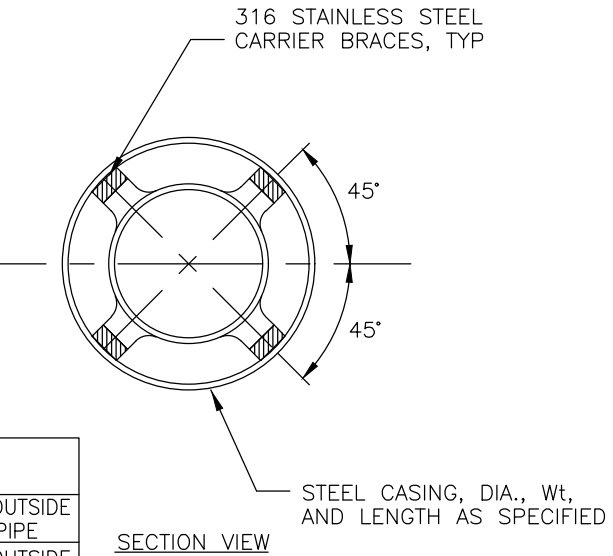
316 STAINLESS STEEL CARRIER BRACES
AT 10.0' CENTERS FOR DIP PIPE AND
AT 6.0' CENTERS FOR PVC PIPE

NOTICE:
SEE DISTRICT STANDARDS,
SECTION 6E & 7M FOR
ADDITIONAL REQUIREMENTS



STEEL CASING, SEE
DISTRICT STANDARDS
SECTION 6E FOR WALL
THICKNESS

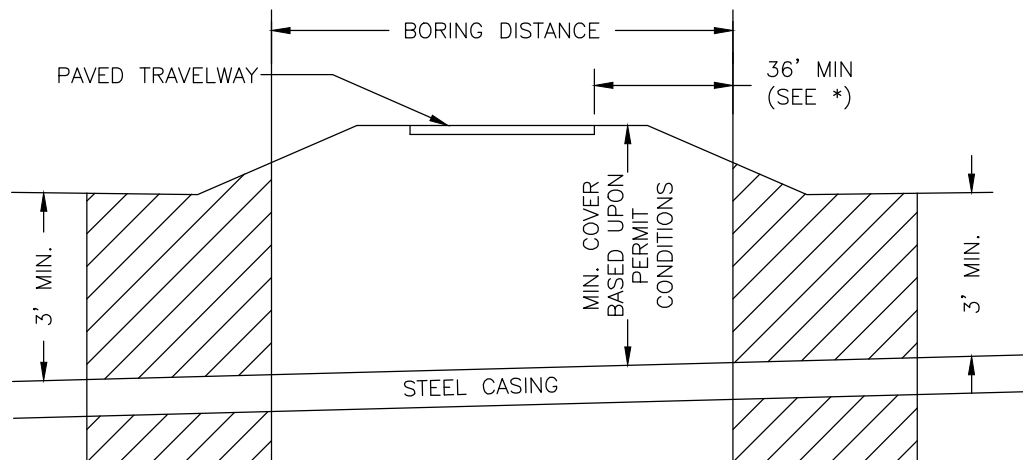
CARRIER INSIDE DIAMETER (ID)	CASING INSIDE DIAMETER (ID)
2"-4"	2" GREATER THAN LARGEST OUTSIDE DIAMETER (OD) OF CARRIER PIPE
6" OR LARGER	4" GREATER THAN LARGEST OUTSIDE DIAMETER (OD) OF CARRIER PIPE



SECTION VIEW

CASING PIPE SHALL BE THE MINIMUM THICKNESS AS SPECIFIED (OR GREATER IF REQUIRED FOR JACKING) SEAMLESS, WELDED, COLD TAR COATED, STEEL CASING OR APPROVED EQUAL. FIELD JOINTS SHALL BE "PERMALOCK" PUSH-ON MACHINED JOINTS OR APPROVED EQUAL. BOTH ENDS OF CASING SHALL BE SEALED WITH A DISTRICT APPROVED 1/8" THICK RUBBER END SEAL. STEEL CASING SHALL MEET ASTM A-139 L.R. REQUIREMENTS FOR GRADE B, WITH MINIMUM YIELD OF 35,000 PSI & MINIMUM TENSILE STRENGTH OF 60,000 P.S.I.

JACK AND BORE STEEL ENCASEMENT



NOTE: DEPTH OF CASING AND LOCATION OF BORE PITS SHALL CONFORM TO ALL APPLICABLE SCDOT AND MUNICIPAL PERMIT CONDITIONS

*THE NEAR EDGE OF THE PIT CAN BE NO CLOSER TO THE EDGE OF THE TRAVELWAY THAN ITS DEPTH BELOW THE SURFACE OF THE TRAVELWAY UNLESS BULKHEADED.

BORING PIT LOCATION

JAMES ISLAND PUBLIC SERVICE DISTRICT

JACK AND BORE

DRAWING:

3

DATE: 05/24/16

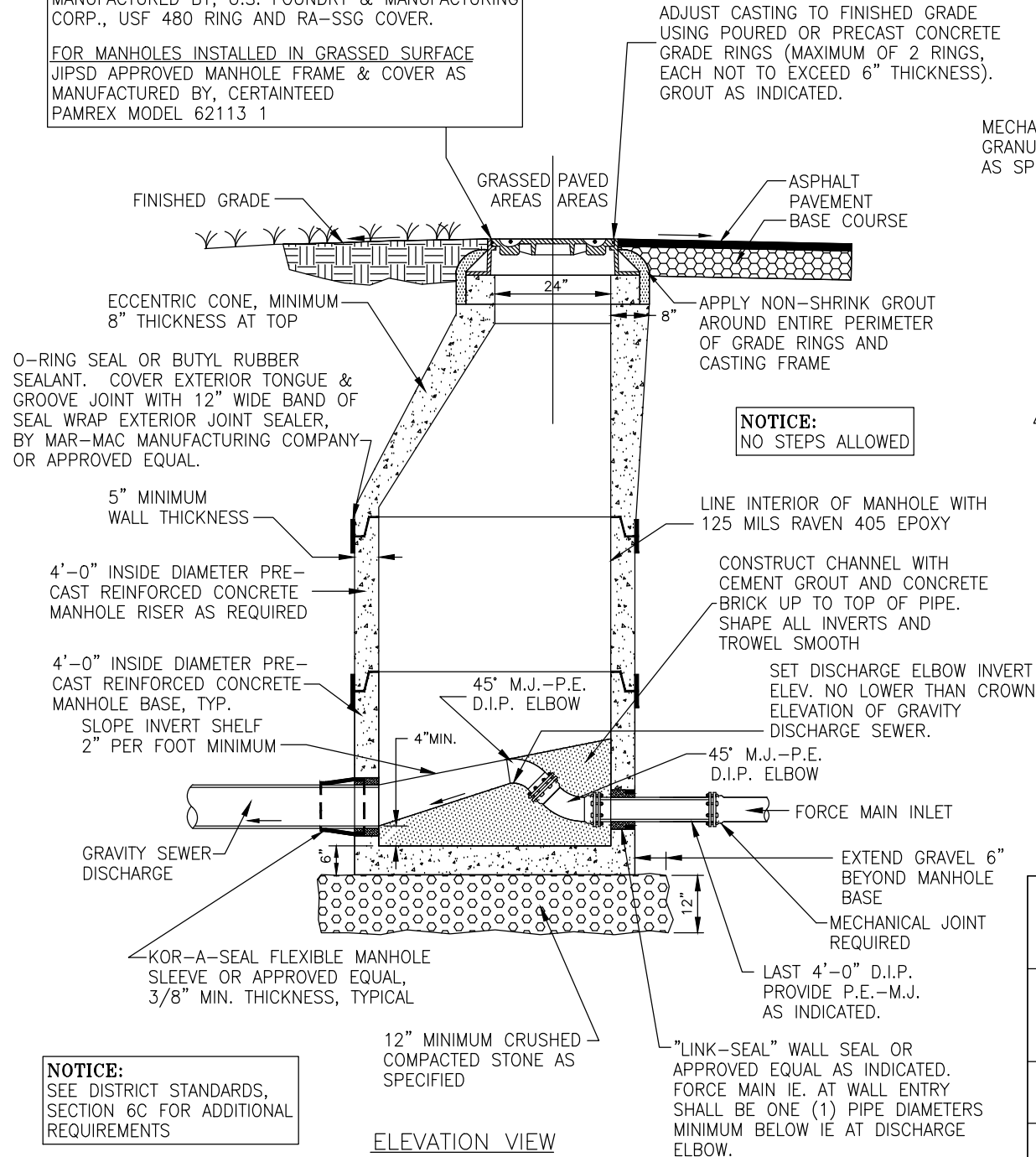
DRAWN BY: GRG & ASSOC., INC

SCALE: NTS

APPROVED BY: DJH

FOR MANHOLES INSTALLED IN PAVED SURFACE
JIPSD APPROVED MANHOLE FRAME & COVER AS
MANUFACTURED BY, U.S. FOUNDRY & MANUFACTURING
CORP., USF 480 RING AND RA-SSG COVER.

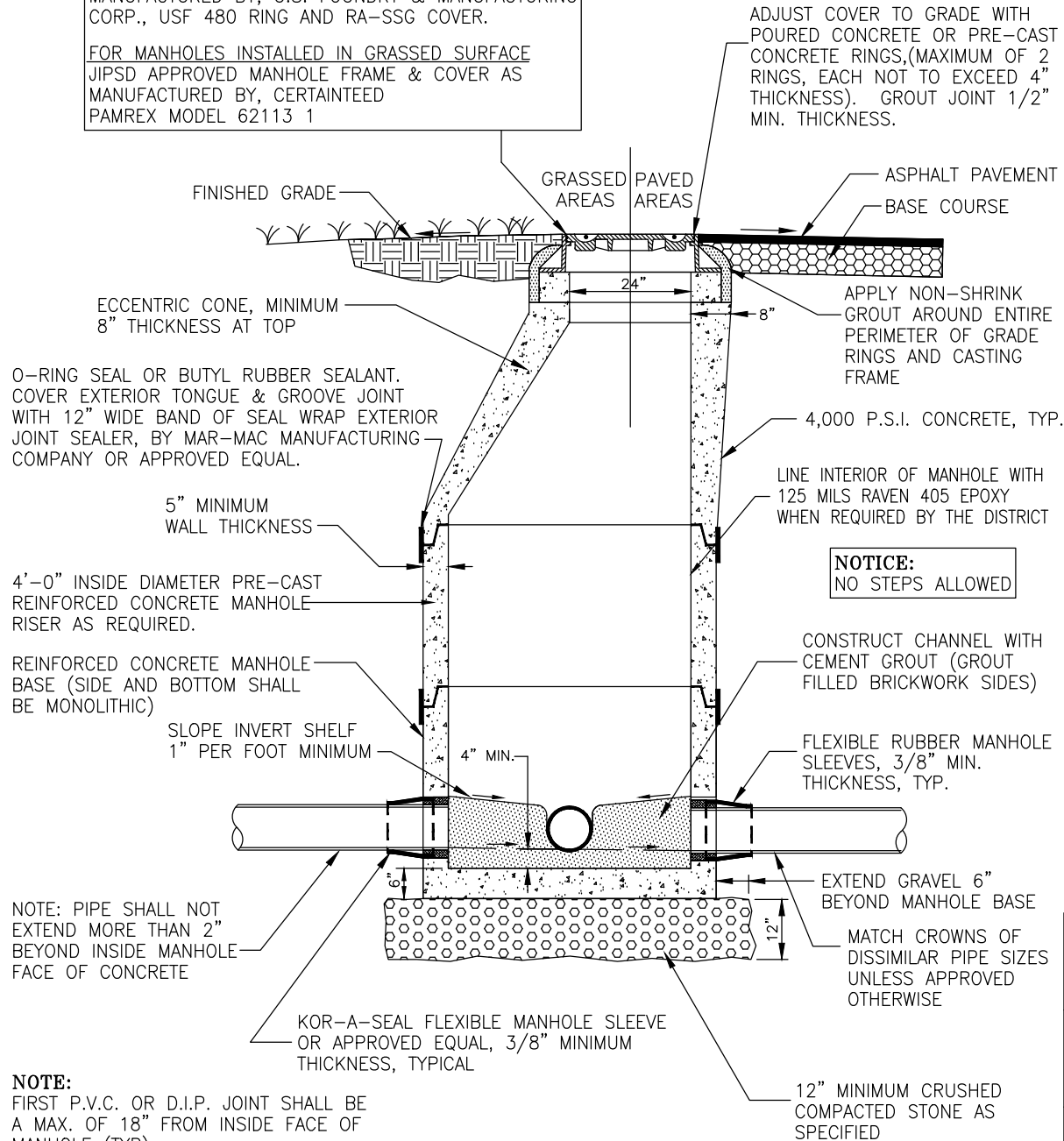
FOR MANHOLES INSTALLED IN GRASSED SURFACE
JIPSD APPROVED MANHOLE FRAME & COVER AS
MANUFACTURED BY, CERTANTEED
PAMREX MODEL 62113 1



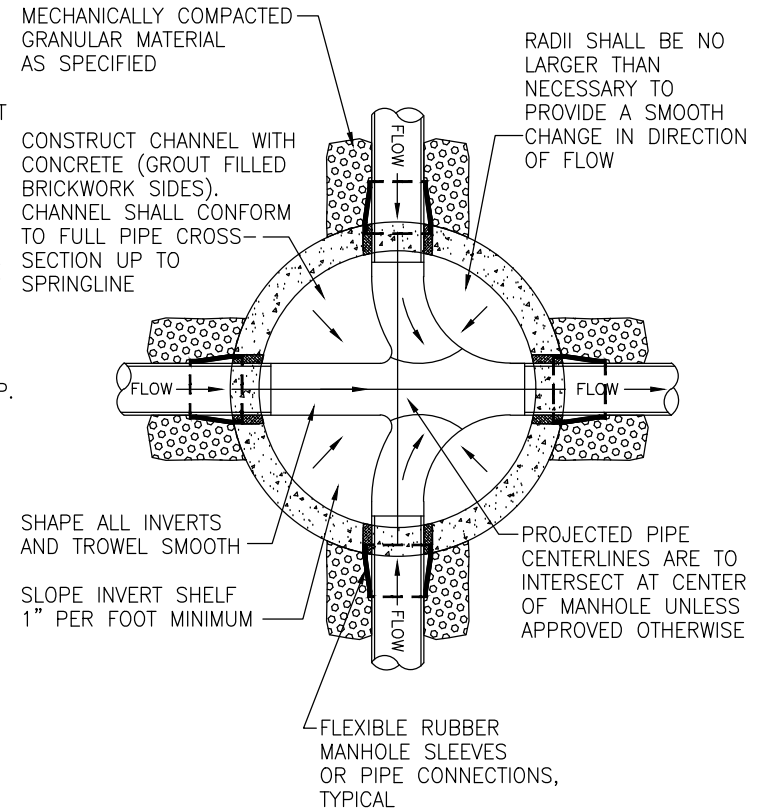
FOR MANHOLES INSTALLED IN PAVED SURFACE
JIPSD APPROVED MANHOLE FRAME & COVER AS
MANUFACTURED BY, U.S. FOUNDRY & MANUFACTURING
CORP., USF 480 RING AND RA-SSG COVER.

FOR MANHOLES INSTALLED IN GRASSED SURFACE
JIPSD APPROVED MANHOLE FRAME & COVER AS
MANUFACTURED BY, CERTAINTED
PAMREX MODEL 62113 1

NOTICE:
SEE DISTRICT STANDARDS,
SECTION 6C FOR ADDITIONAL
REQUIREMENTS



ELEVATION VIEW



PLAN VIEW

JAMES ISLAND PUBLIC SERVICE DISTRICT

STANDARD MANHOLE

DRAWING:

6

DATE: 05/24/16

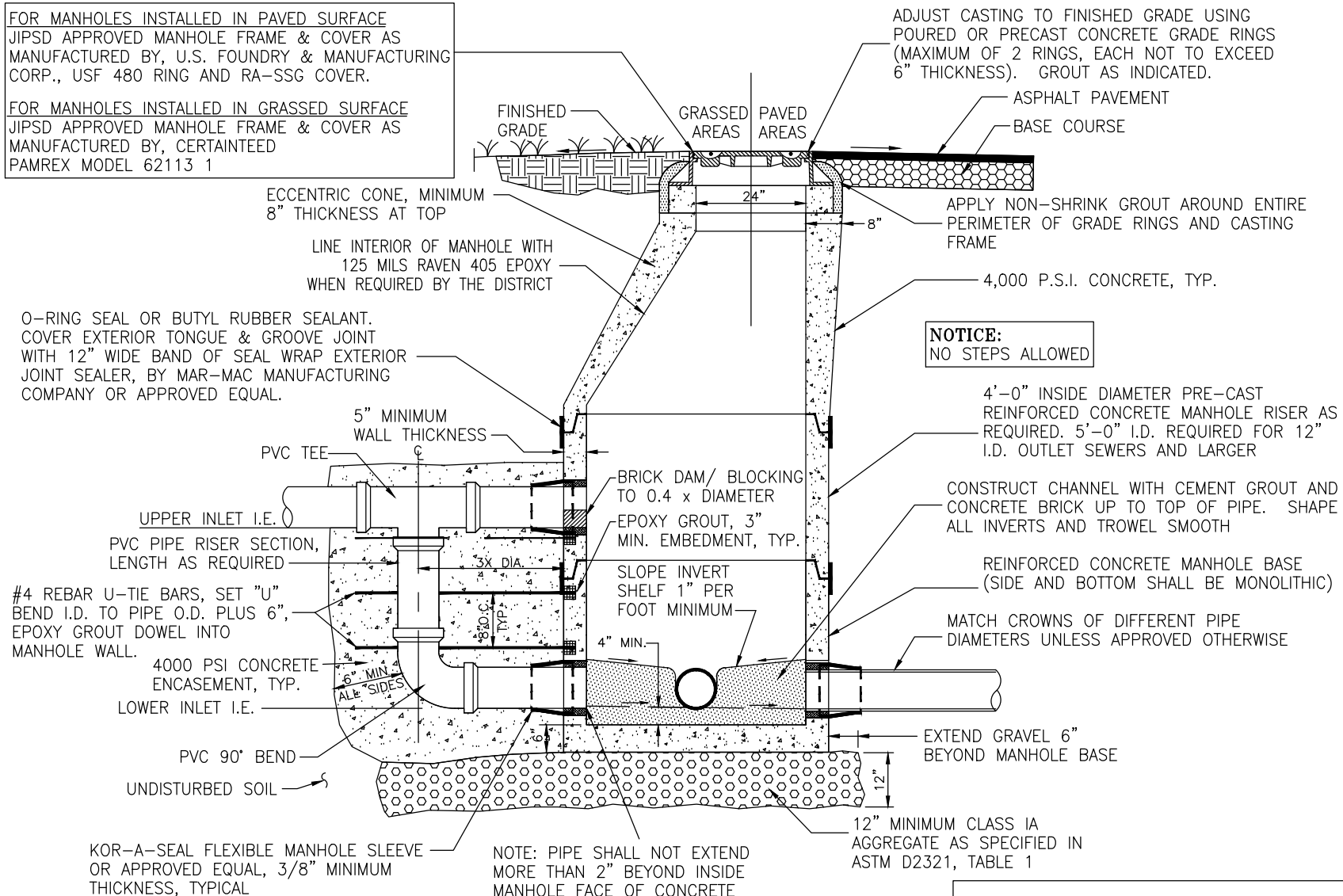
DRAWN BY: GRG & ASSOC., INC

SCALE: NTS

APPROVED BY: DJH

FOR MANHOLES INSTALLED IN PAVED SURFACE
JIPSD APPROVED MANHOLE FRAME & COVER AS
MANUFACTURED BY, U.S. FOUNDRY & MANUFACTURING
CORP., USF 480 RING AND RA-SSG COVER.

FOR MANHOLES INSTALLED IN GRASSED SURFACE
JIPSD APPROVED MANHOLE FRAME & COVER AS
MANUFACTURED BY, CERTANTEED
PAMREX MODEL 62113 1



NOTICE

NOTICE:
SEE DISTRICT STANDARDS,
SECTION 6C FOR ADDITIONAL
REQUIREMENTS

EXTERIOR DROP CONNECTIONS SHALL ALSO BE CONSTRUCTED
ON EXISTING MANHOLES AS APPLICABLE.

JAMES ISLAND PUBLIC SERVICE DISTRICT

EXTERIOR DROP MANHOLE

DRAWING:

7

DATE: 05/24/16

DRAWN BY: GRG & ASSOC., INC

SCALE: NTS

APPROVED BY: DJH

ECCENTRIC FLAT TOP, 8"
TOP THICKNESS, MINIMUM

FOR MANHOLES INSTALLED IN PAVED SURFACE
JIPSD APPROVED MANHOLE FRAME & COVER AS
MANUFACTURED BY, U.S. FOUNDRY & MANUFACTURING
CORP., USF 480 RING AND RA-SSG COVER.

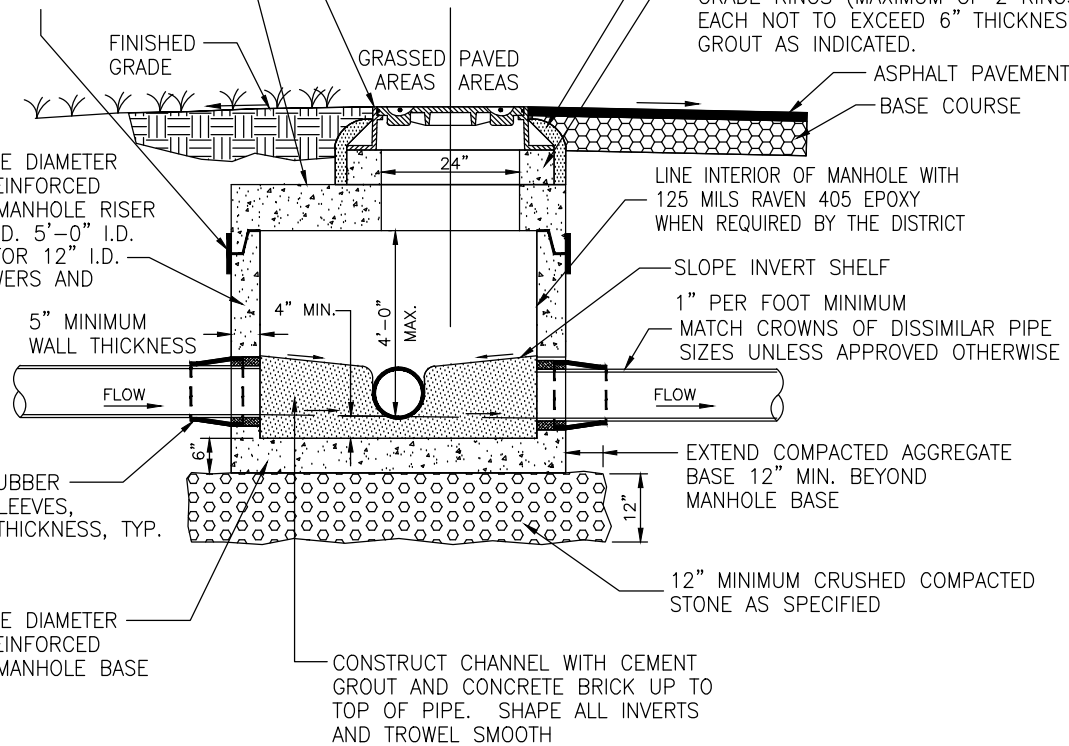
FOR MANHOLES INSTALLED IN GRASSED SURFACE
JIPSD APPROVED MANHOLE FRAME & COVER AS
MANUFACTURED BY, CERTANTEED
PAMREX MODEL 62113 1

O-RING SEAL OR BUTYL RUBBER
SEALANT. COVER EXTERIOR
TONGUE & GROOVE JOINT WITH
12" WIDE BAND OF SEAL WRAP
EXTERIOR JOINT SEALER, BY
MAR-MAC MANUFACTURING COMPANY
OR APPROVED EQUAL.

NOTICE:
NO STEPS ALLOWED

APPLY NON-SHRINK GROUT
AROUND ENTIRE PERIMETER
OF GRADE RINGS AND CASTING
FRAME

ADJUST CASTING TO FINISHED GRADE
USING POURED OR PRECAST CONCRETE
GRADE RINGS (MAXIMUM OF 2 RINGS,
EACH NOT TO EXCEED 6" THICKNESS).
GROUT AS INDICATED.



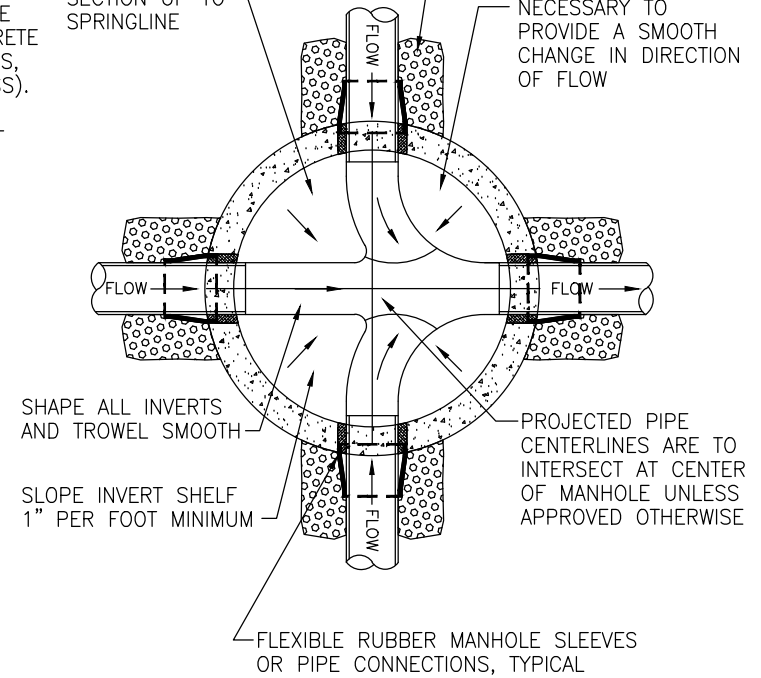
ELEVATION VIEW

NOTICE:
SEE DISTRICT STANDARDS,
SECTION 6C FOR ADDITIONAL
REQUIREMENTS

CONSTRUCT CHANNEL WITH
CONCRETE (GROUT FILLED
BRICKWORK SIDES).
CHANNEL SHALL CONFORM
TO FULL PIPE CROSS-
SECTION UP TO
SPRINGLINE

MECHANICALLY COMPACTED
GRANULAR MATERIAL
AS SPECIFIED

RADII SHALL BE NO
LARGER THAN
NECESSARY TO
PROVIDE A SMOOTH
CHANGE IN DIRECTION
OF FLOW



PLAN VIEW

JAMES ISLAND PUBLIC SERVICE DISTRICT

FLAT TOP MANHOLE
(SHALLOW MANHOLE)

DRAWING:

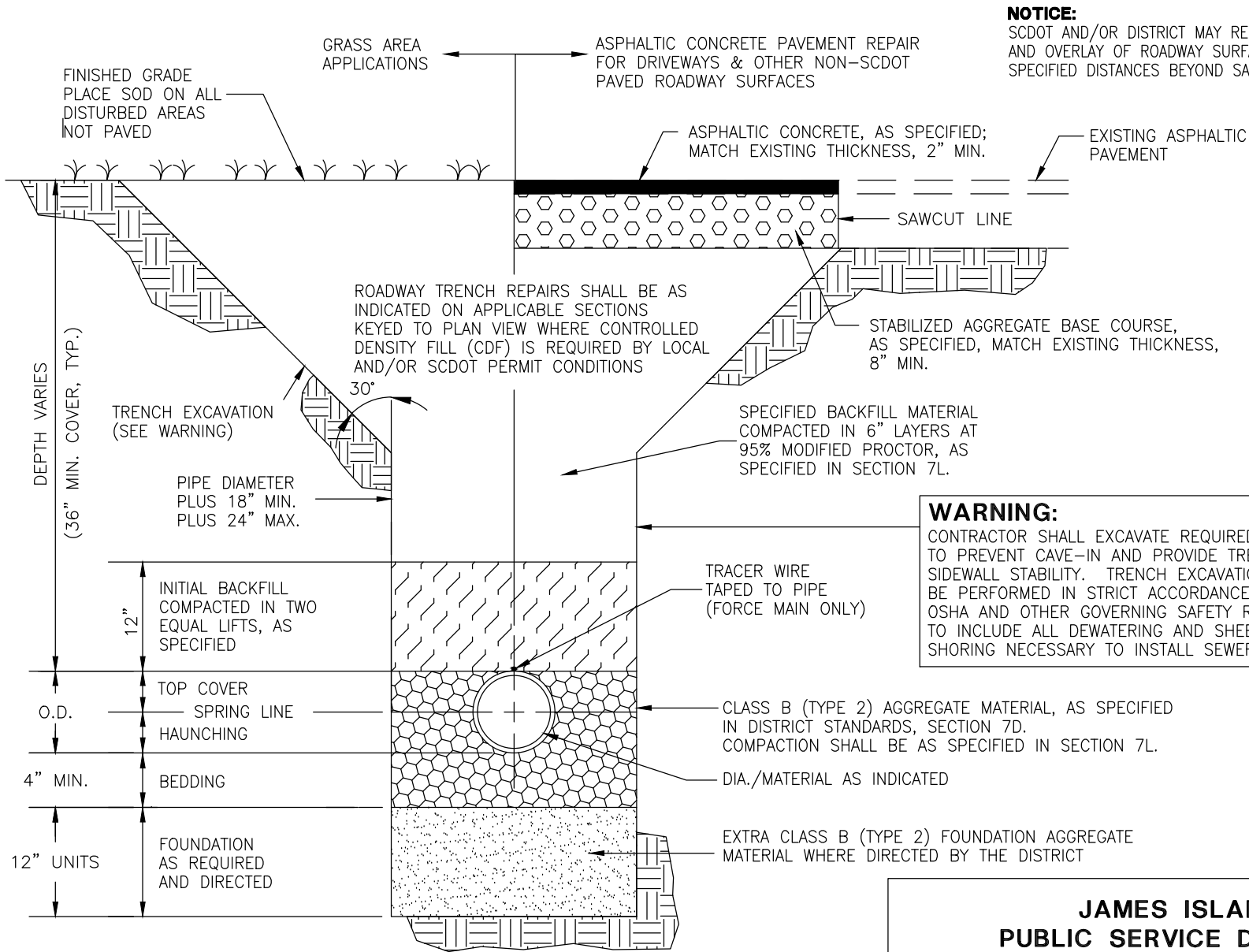
8

DATE: 05/24/16

DRAWN BY: GRG & ASSOC., INC

SCALE: NTS

APPROVED BY: DJH



NOTICE:
SCDOT AND/OR DISTRICT MAY REQUIRE ACSC MILLING AND OVERLAY OF ROADWAY SURFACE TO DIRECTED/PERMIT SPECIFIED DISTANCES BEYOND SAW-CUT EDGES.

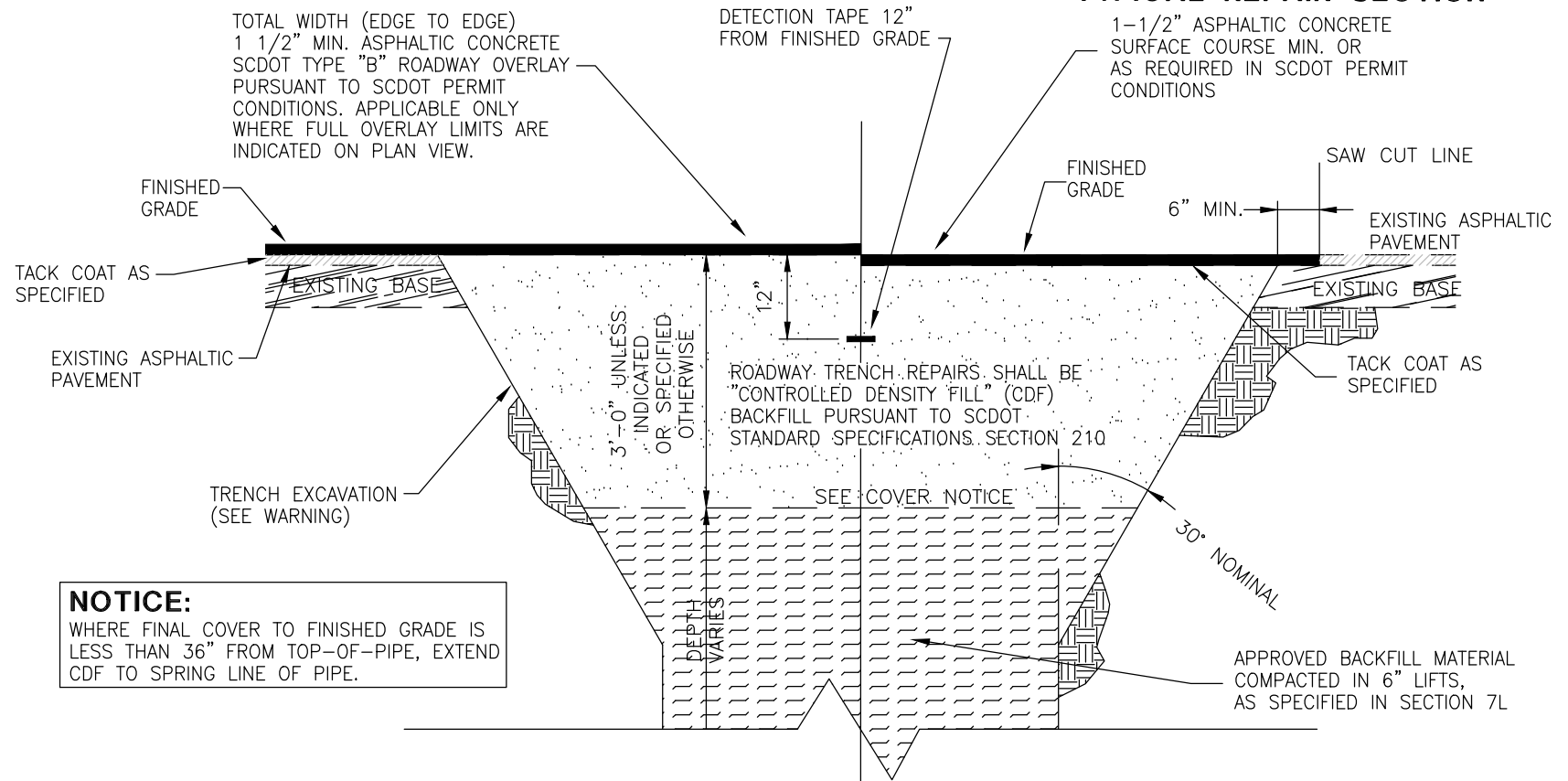
WARNING:
CONTRACTOR SHALL EXCAVATE REQUIRED TRENCH TO PREVENT CAVE-IN AND PROVIDE TRENCH SIDEWALL STABILITY. TRENCH EXCAVATION SHALL BE PERFORMED IN STRICT ACCORDANCE WITH OSHA AND OTHER GOVERNING SAFETY REGULATIONS TO INCLUDE ALL DEWATERING AND SHEETING & SHORING NECESSARY TO INSTALL SEWER.

NOTICE:
TRENCH EXCAVATION AND BACKFILL SHALL BE PURSUANT TO DISTRICT STANDARDS, SECTION 7.

JAMES ISLAND PUBLIC SERVICE DISTRICT	
TYPICAL TRENCH SECTION	DRAWING: 9
DATE: 05/24/16	DRAWN BY: GRG & ASSOC., INC
SCALE: NTS	APPROVED BY: DJH

NOTICE:

SCDOT AND/OR DISTRICT MAY REQUIRE ACSC MILLING AND OVERLAY OF ROADWAY SURFACE TO DIRECTED/PERMIT SPECIFIED DISTANCES BEYOND SAW-CUT EDGES.

TYPICAL OVERLAY SECTION**NOTICE:**

WHERE FINAL COVER TO FINISHED GRADE IS LESS THAN 36" FROM TOP-OF-PIPE, EXTEND CDF TO SPRING LINE OF PIPE.

WARNING:

CONTRACTOR SHALL EXCAVATE REQUIRED TRENCH TO PREVENT CAVE-IN AND PROVIDE TRENCH SIDEWALL STABILITY. TRENCH EXCAVATION SHALL BE PERFORMED IN STRICT ACCORDANCE WITH OSHA AND OTHER GOVERNING SAFETY REGULATIONS TO INCLUDE ALL DEWATERING AND SHEETING & SHORING NECESSARY TO INSTALL SEWER.

NOTICE:

THIS SECTION SHALL BE APPLICABLE FOR ALL TRENCH EXCAVATIONS EXTENDING 3'-0" BEYOND EDGES OF EXISTING PAVED ROADWAY SURFACES INCLUDING DRIVEWAYS WITHIN 3'-0" OF ROADWAY PAVEMENT EDGES OR CURBS.

**JAMES ISLAND
PUBLIC SERVICE DISTRICT**

TRENCH SECTION IN SCDOT
RIGHT-OF-WAY

DRAWING:

10

DATE: 05/24/16

DRAWN BY: GRG & ASSOC., INC

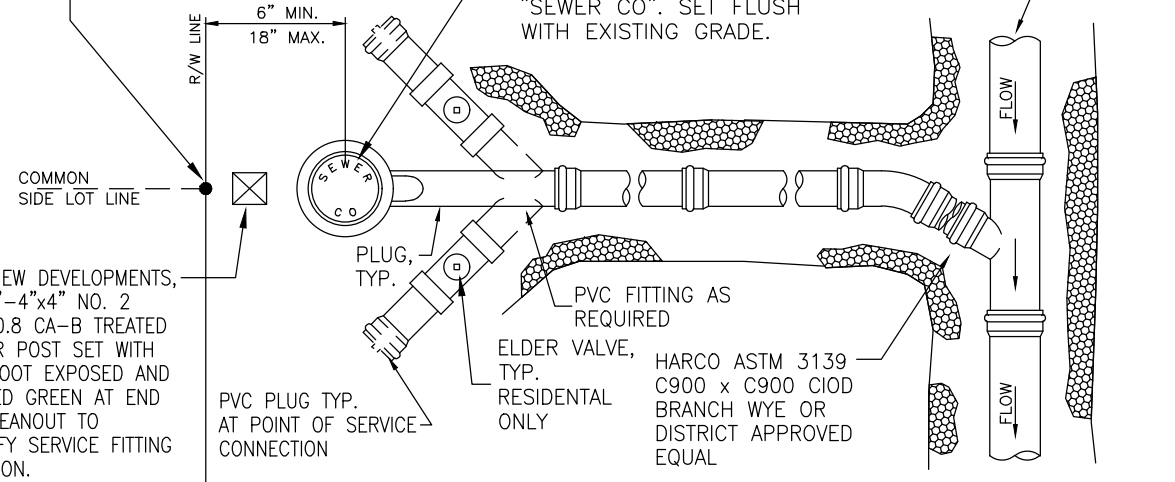
SCALE: NTS

APPROVED BY: DJH

CONTRACTOR SHALL RESET ALL
DISTURBED/DISPLACED PROPERTY
MONUMENTS BY A DISTRICT
APPROVED P.L.S. AT NO
COST TO THE DISTRICT

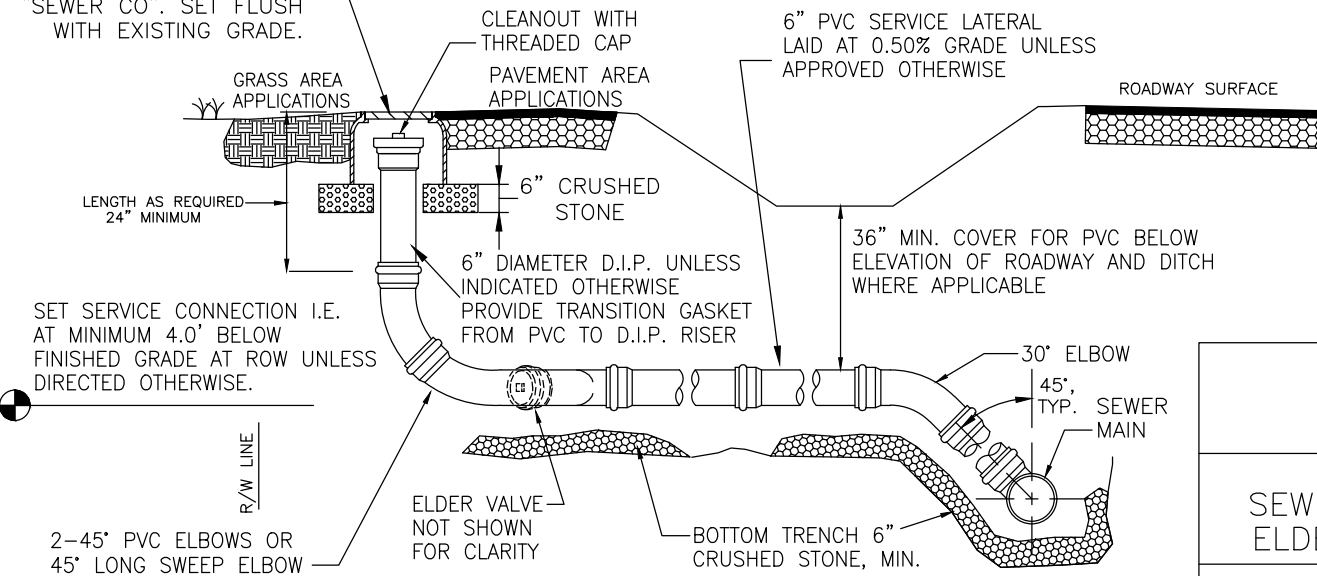
SOUTHEASTERN
DISTRIBUTORS, INC. MB-9
"LITTLE RHINO" BOX WITH
CAST IRON LID LETTERED
"SEWER CO". SET FLUSH
WITH EXISTING GRADE.

SOUTHEASTERN
DISTRIBUTORS, INC. MB-9
"LITTLE RHINO" BOX WITH
CAST IRON LID LETTERED
"SEWER VALVE". SET
FLUSH WITH EXISTING
GRADE.

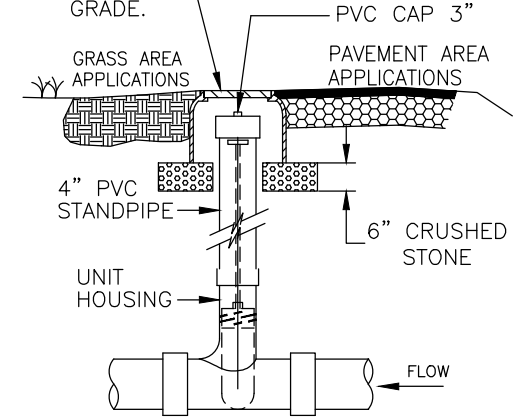


PLAN VIEW

SOUTHEASTERN
DISTRIBUTORS, INC. MB-9
"LITTLE RHINO" BOX WITH
CAST IRON LID LETTERED
"SEWER CO". SET FLUSH
WITH EXISTING GRADE.



SECTION VIEW



ELDER VALVE

NOTICE:
SEE DISTRICT STANDARDS,
SECTION 7J FOR ADDITIONAL
REQUIREMENTS

NOTICE:
MATERIALS SHALL BE AS
SPECIFIED IN SECTION 6B
UNLESS INDICATED
OTHERWISE HEREON

JAMES ISLAND PUBLIC SERVICE DISTRICT

SEWER SERVICE WITH
ELDER VALVE

DRAWING:

11

DATE: 05/24/16

DRAWN BY: GRG & ASSOC., INC

SCALE: NTS

APPROVED BY: DJH

NOTICE:

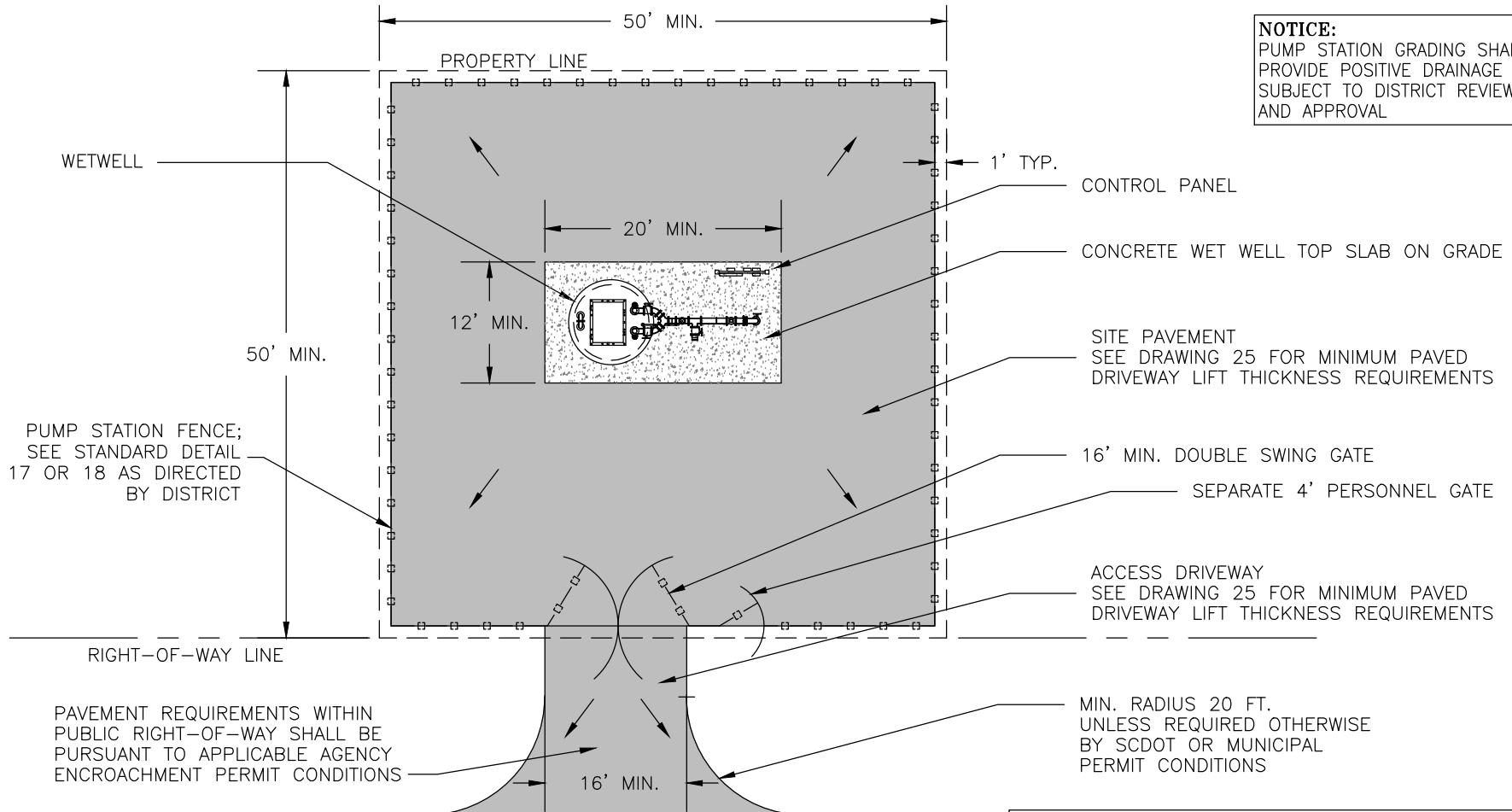
1. MAXIMUM SITE GRADING FROM WET WELL TOP SLAB TO ASPHALT SURFACE PERIMETER SHALL BE 1% UNLESS APPROVED OTHERWISE
2. EXTEND PAVEMENT TO FENCE LINE UNLESS APPROVED OTHERWISE

NOTICE:

SEE DISTRICT STANDARDS, SECTIONS 11, 12, & 13 FOR ADDITIONAL REQUIREMENTS

NOTICE:

PUMP STATION GRADING SHALL PROVIDE POSITIVE DRAINAGE SUBJECT TO DISTRICT REVIEW AND APPROVAL



**JAMES ISLAND
PUBLIC SERVICE DISTRICT**

TYPICAL PUMP STATION
SITE PLAN

DRAWING:

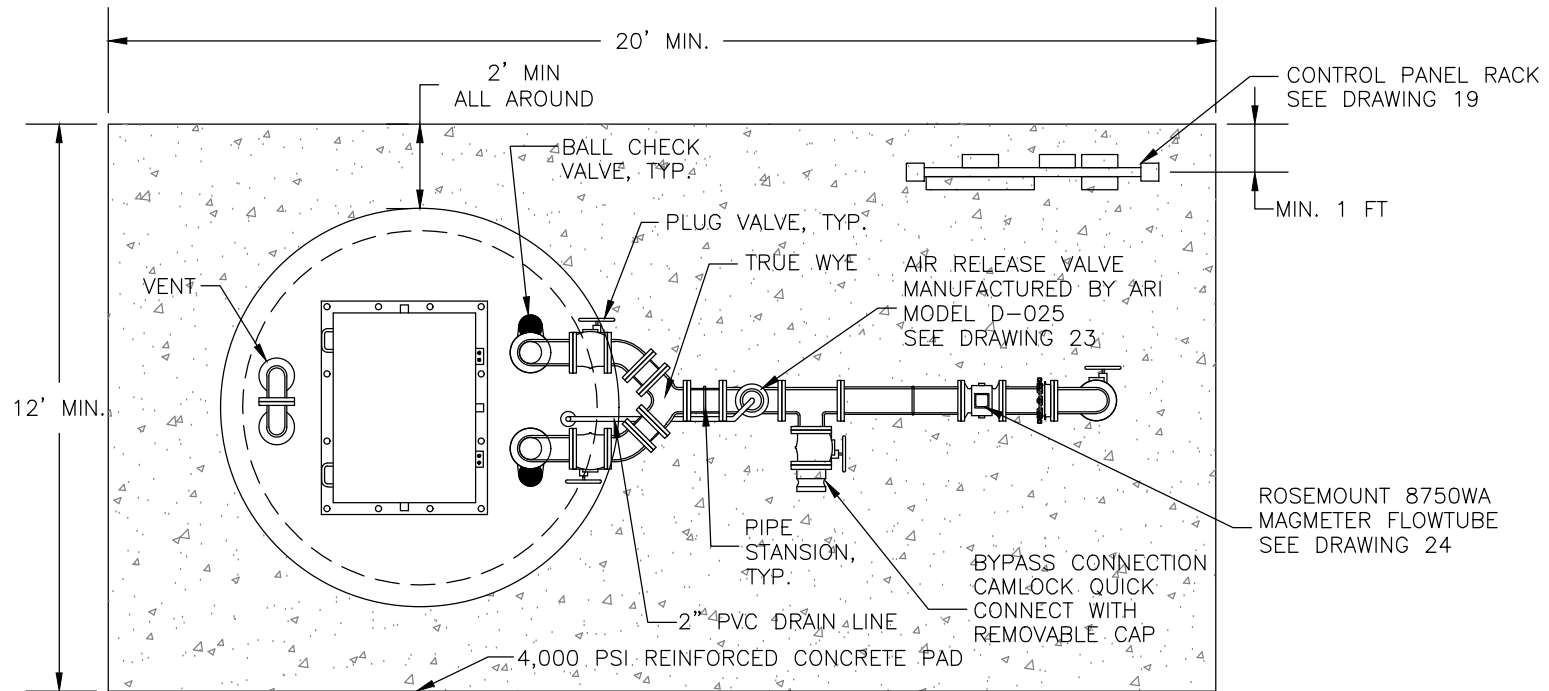
12

DATE: 05/24/16

DRAWN BY: GRG & ASSOC., INC

SCALE: NTS

APPROVED BY: DJH



NOTICE:

THE DISTRICT MAY REQUIRE REVISED PIPING LAYOUT TO ACCOMMODATE A DISTRICT REQUIRED AND APPROVED FLOW METERING DEVICE WITH LOCAL READOUT AND REMOTE SCADA/RTU MONITORING.

NOTICE:

1. SEE DISTRICT STANDARDS SECTIONS 11, 12, & 13 FOR ADDITIONAL REQUIREMENTS
2. PIPING LAYOUT INDICATED IS TYPICAL FOR 4" AND 6" DIA. STATION PIPING. LARGER STATIONS WITH 8" DIA. AND LARGER PIPING SHALL BE SUBJECT TO DISTRICT PRELIMINARY DESIGN REVIEW.
3. DO NOT PAINT STAINLESS STEEL FASTNERS AND STAINLESS STEEL PIPING.
4. ALL ELECTRICAL EQUIPMENT AND APPURTENANCES LOCATED BELOW 1.25 FEET ABOVE THE BASE FEMA FLOOD ELEVATION SHALL BE NEMA 6X.

**JAMES ISLAND
PUBLIC SERVICE DISTRICT**

TYPICAL PUMP STATION
TOP PLAN

DRAWING:

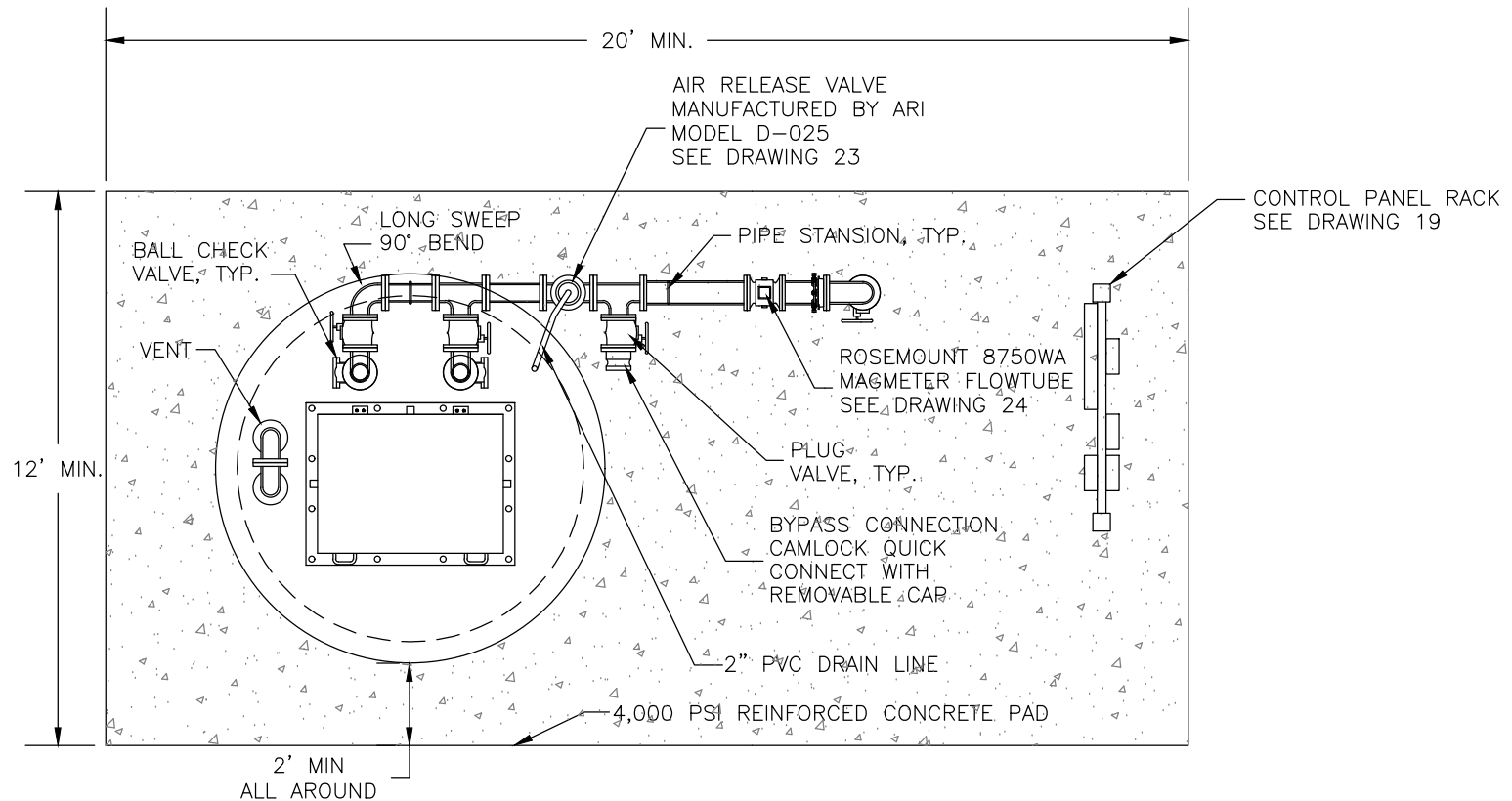
13

DATE: 05/24/16

DRAWN BY: GRG & ASSOC., INC

SCALE: NTS

APPROVED BY: DJH



NOTICE:

THE DISTRICT MAY REQUIRE REVISED PIPING LAYOUT TO ACCOMMODATE A DISTRICT REQUIRED AND APPROVED FLOW METERING DEVICE WITH LOCAL READOUT AND REMOTE SCADA/RTU MONITORING.

NOTICE:

1. SEE DISTRICT STANDARDS SECTIONS 11, 12, & 13 FOR ADDITIONAL REQUIREMENTS
2. PIPING LAYOUT INDICATED ABOVE MAY BE UTILIZED TO ACCOMMODATE SPECIAL SPACE AND ACCESS REQUIREMENTS SUBJECT TO DISTRICT APPROVAL
3. PIPING LAYOUT INDICATED IS TYPICAL FOR 4" AND 6" DIA. STATION PIPING. LARGER STATIONS WITH 8" DIA. AND LARGER PIPING SHALL BE SUBJECT TO DISTRICT PRELIMINARY DESIGN REVIEW.
4. DO NOT PAINT STAINLESS STEEL BOLTS AND PIPING.
5. ALL ELECTRICAL EQUIPMENT AND APPURTENANCES LOCATED BELOW 1.25 FEET ABOVE THE BASE FEMA FLOOD ELEVATION SHALL BE NEMA 6X.

**JAMES ISLAND
PUBLIC SERVICE DISTRICT**

TYPICAL PUMP STATION
TOP PLAN (ALT.)

DRAWING:

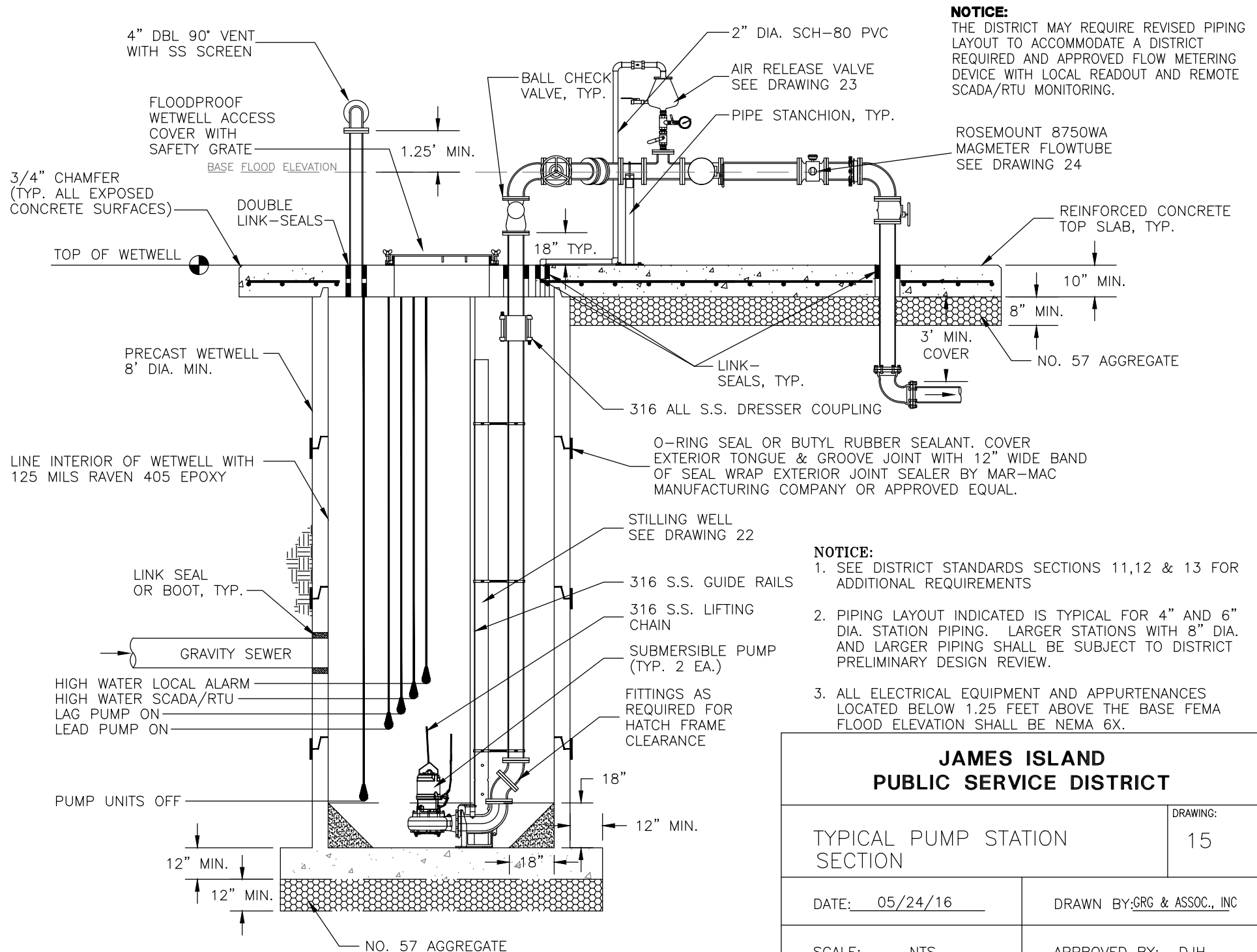
14

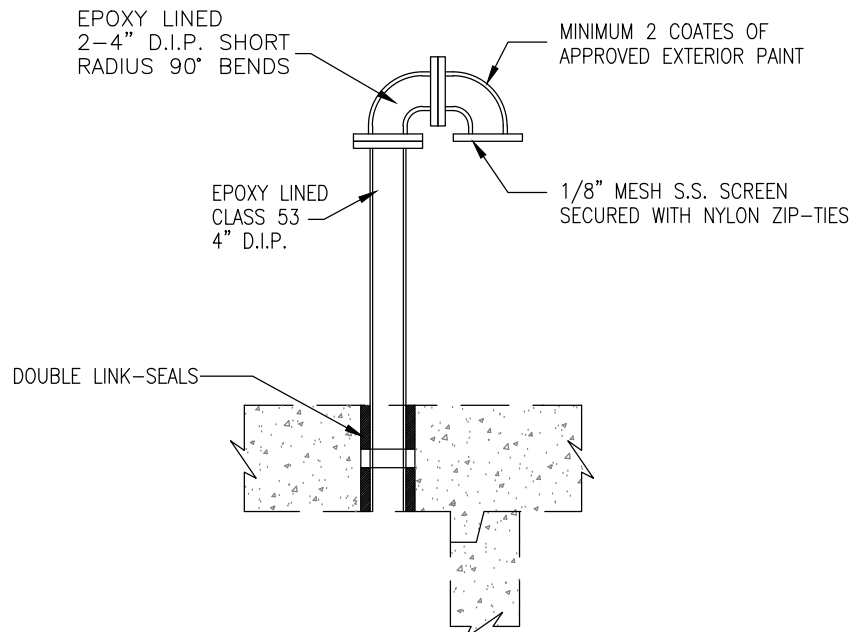
DATE: 05/24/16

DRAWN BY: GRG & ASSOC., INC

SCALE: NTS

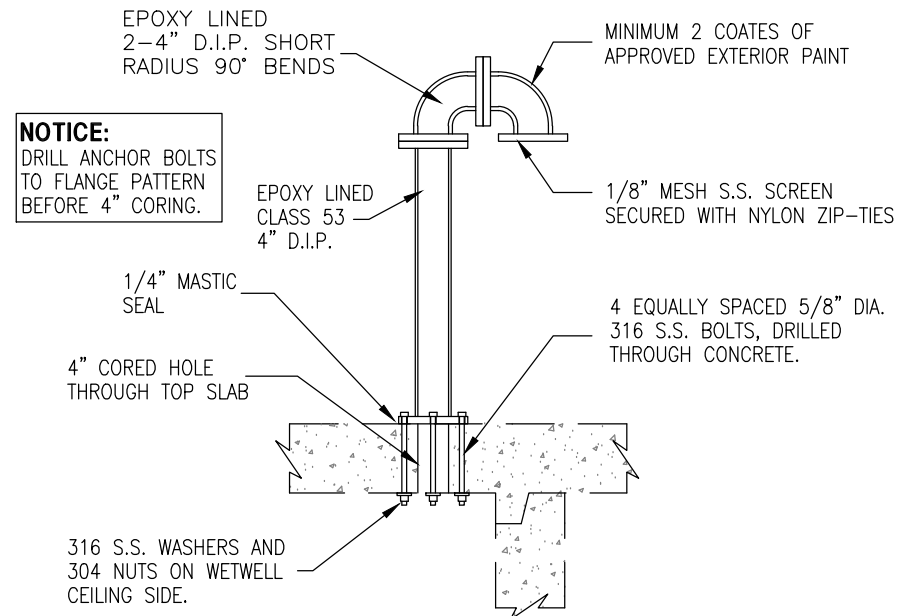
APPROVED BY: DJH





VENT DETAIL

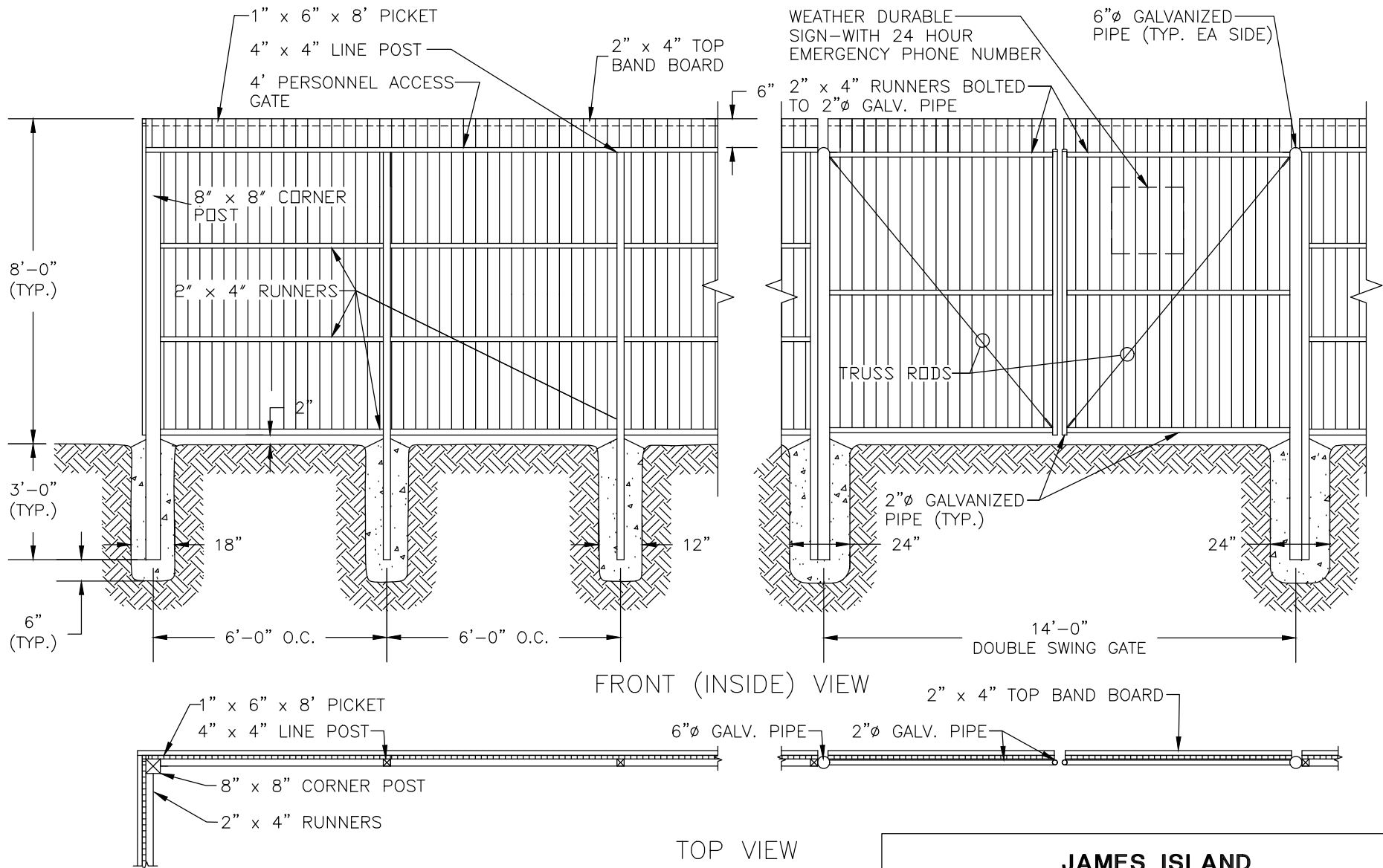
FOR SLAB THICKNESS 10" OR GREATER



VENT DETAIL

FOR SLAB THICKNESS LESS THAN 10"

JAMES ISLAND PUBLIC SERVICE DISTRICT			
TYPICAL PUMP STATION VENT DETAIL			DRAWING: 16
DATE: 05/24/16		DRAWN BY: GRG & ASSOC., INC	
SCALE: NTS		APPROVED BY: DJH	



NOTES:

1. ALL WOOD SHALL BE PRESSURE TREATED.
2. ALL HARDWARE SHALL BE GALVANIZED.
3. ALL CORNER POSTS, LINE POSTS AND GATE POSTS SHALL BE SET IN 3000psi CONCRETE FOOTINGS AS SHOWN.
4. GATE SHALL BE EQUIPPED WITH A PROP POST CENTER LATCH AND HASP ASSEMBLY. A GROUND ANCHOR CAST IN CONCRETE SHALL BE PROVIDED.
5. 4' EMPLOYEE ENTRANCE GATE SHALL BE INSTALLED ADJACENT TO 16' VEHICLE GATE.
6. VEHICLE GATE TO BE CENTERED WITH WETWELL OPENING.

**JAMES ISLAND
PUBLIC SERVICE DISTRICT**

TYPICAL PUMP STATION FENCE
WOODEN FENCE

DRAWING:

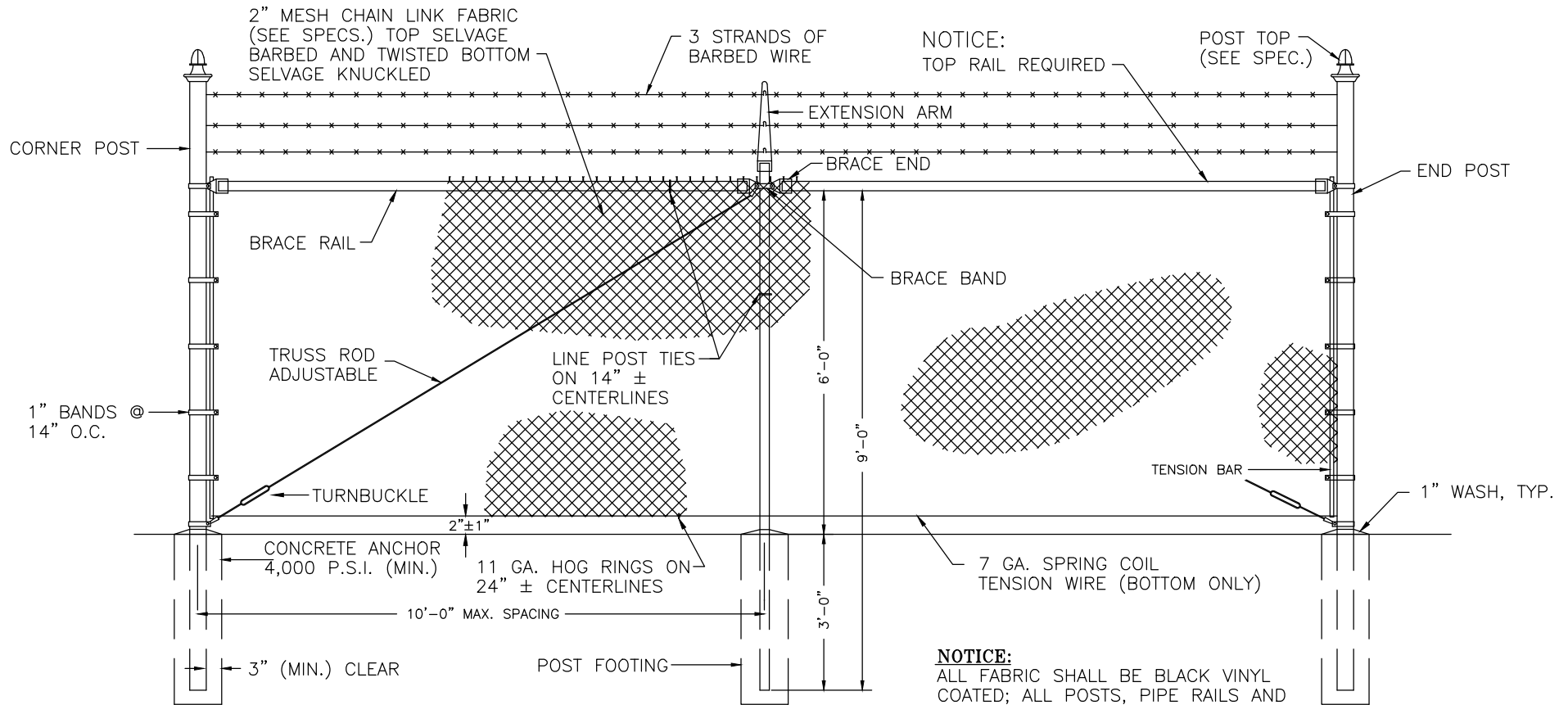
17

DATE: 05/24/16

DRAWN BY: GRG & ASSOC., INC

SCALE: NTS

APPROVED BY: DJH



NOTICE:
ALL FABRIC SHALL BE BLACK VINYL COATED; ALL POSTS, PIPE RAILS AND APPURTENANCES SHALL BE BLACK VINYL COATED TO MATCH FABRIC

FENCING SPECIFICATIONS:

1. ALL FENCE MATERIAL SHALL BE CLASS I GALVANIZED COATED.
2. FABRIC SHALL BE 6 FEET HIGH, ENDS BARBED, COMMERCIAL GRADE 9 GAUGE, 2" MESH WITH BLACK VINYL COATED FABRIC EXCEPT AS NOTED ON PLAN VIEWS.
3. END, CORNER, PULL POSTS, AND ACCESSORIES SHALL GALVANIZED, BLACK VINYL COATED TO MATCH FABRIC.
4. TOP RAIL, CORNER AND LINE POSTS SHALL BE SIZED AS SPECIFIED, GALVANIZED COATED, AND VINYL COATED TO MATCH FABRIC.
5. BOTTOM TENSION WIRE SHALL BE 7 GAUGE SPRING COIL WIRE WITH GREEN VINYL OR GALVANIZED COATING AND PAINTED TO MATCH FABRIC.
6. BARB WIRE SHALL BE 12.5 GAUGE GALVANIZED BARB; 14 GAUGE FOUR POINT PATTERN ON 5 INCHES CENTERS, THREE (3) ROWS OF OUTWARD FACING BARBED WIRE SHALL BE USED.
7. GATE POSTS SHALL BE AS SPECIFIED UNLESS INDICATED OTHERWISE.
8. GATE SHALL BE OF THE WIDTH AND TYPE (SINGLE OR DOUBLE) AND AT THE LOCATIONS INDICATED. GATE SHALL BE EQUIPPED WITH A PROP POST CENTER LATCH AND HASP ASSEMBLY. A GROUND ANCHOR CAST IN CONCRETE SHALL BE PROVIDED. GATE SHALL BE FACTORY FABRICATED AND EQUIPPED WITH GATE HOLDERS. ALL GATE MATERIALS SHALL BE PAINTED TO MATCH BLACK VINYL FABRIC.
9. 4' EMPLOYEE ENTRANCE GATE SHALL BE INSTALLED ADJACENT TO 16' VEHICLE GATE
10. VEHICLE GATE TO BE CENTERED WITH WETWELL OPENING.

JAMES ISLAND PUBLIC SERVICE DISTRICT

OPTIONAL CHAIN LINK
PUMP STATION FENCE

DRAWING:

18

DATE: 05/24/16

DRAWN BY: GRG & ASSOC., INC

SCALE: NTS

APPROVED BY: DJH

THERE SHALL BE NO PENETRATIONS
IN THE TOP OF ANY PANEL BOX

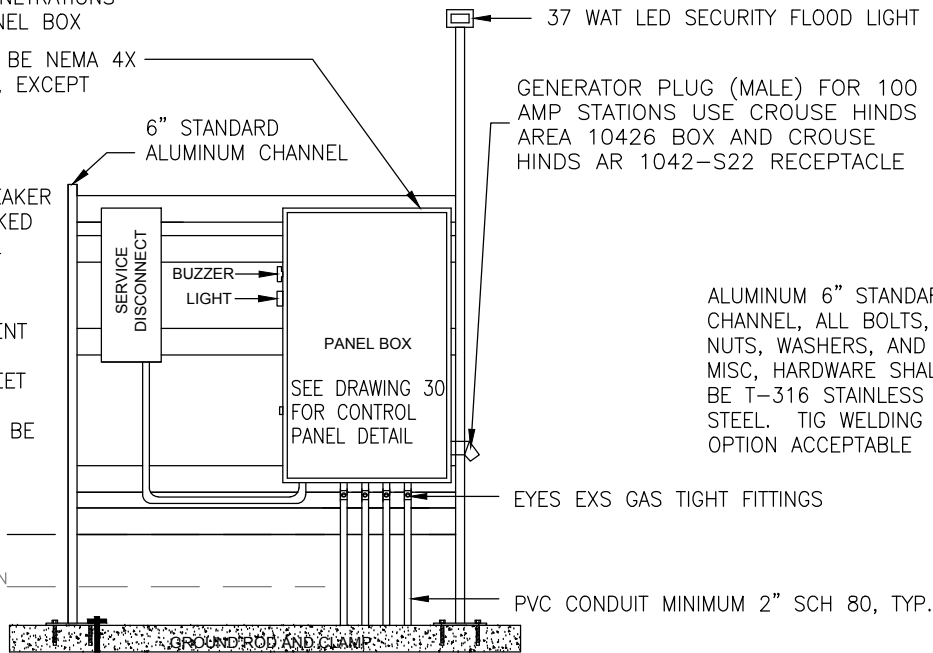
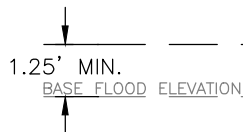
ALL ENCLOSURES SHALL BE NEMA 4X
T-316 STAINLESS STEEL, EXCEPT
AS NOTED BELOW

OPTIONAL:

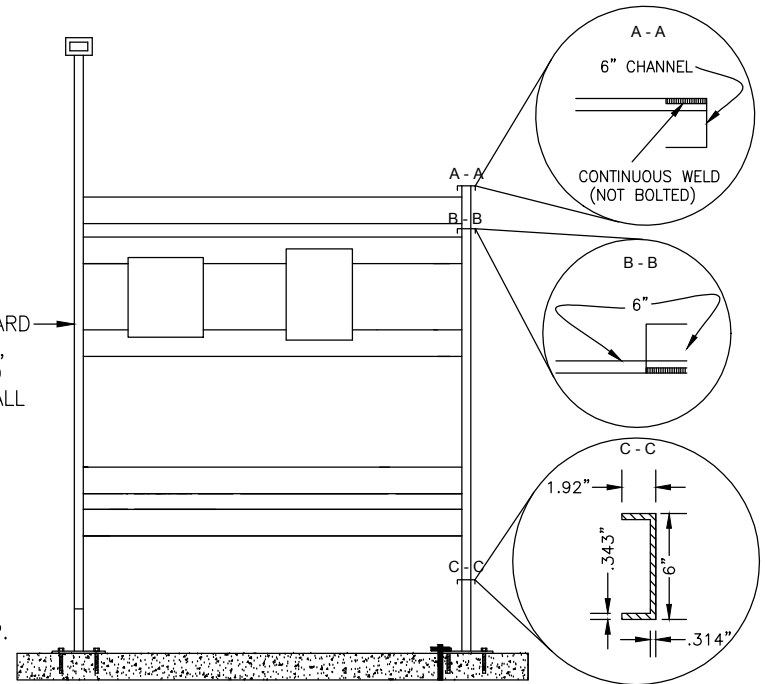
PROVIDE MAIN AND
EMERGENCY CIRCUIT BREAKER
MECHANICALLY INTERLOCKED
IN MAIN CONTROL PANEL

NOTICE:

ALL ELECTRICAL EQUIPMENT
AND APPURTENANCES
LOCATED BELOW 1.25 FEET
ABOVE THE FEMA BASE
FLOOD ELEVATION SHALL BE
NEMA 6X.



ALUMINUM 6" STANDARD CHANNEL, ALL BOLTS, NUTS, WASHERS, AND MISC. HARDWARE SHALL BE T-316 STAINLESS STEEL. TIG WELDING OPTION ACCEPTABLE



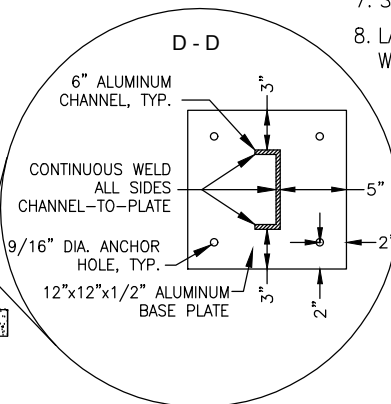
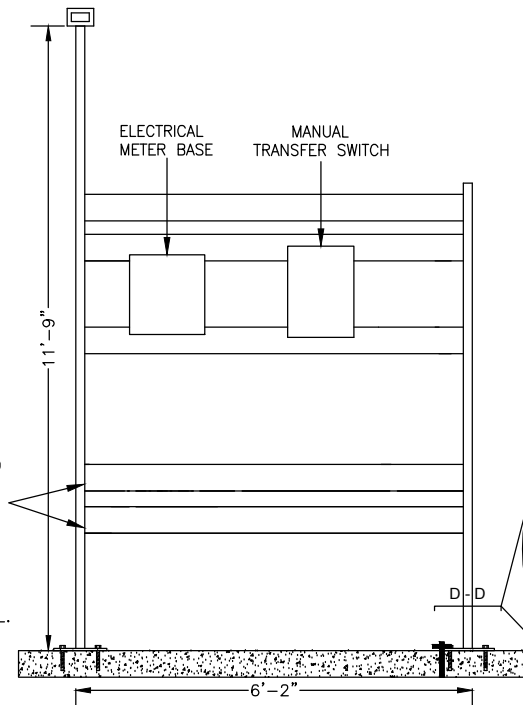
GENERAL NOTES:

1. ALL HINGES, GUIDE HOLDERS, CHAINS HOLDERS, ALL NUTS, BOLTS, WASHERS, GUIDE RAILS AND OTHER FASTENERS SHALL BE T-316 STAINLESS STEEL.
2. ALL WETWELL HARDWARE SHALL BE MOUNTED SUCH THAT ANY COMPONENT CAN BE REMOVED.
3. WETWELL TO HAVE SEPARATE CONDUIT FOR FLOAT CABLES.
4. ALL WORK AND MATERIALS SHALL BE APPROVED BY THE DISTRICT.
5. A SERVICE DISCONNECT (NON-FUSED) SHALL BE PROVIDED BETWEEN ELECTRICAL UTILITY METER AND CONTROL EQUIPMENT.
6. DESIGN OF CONTROL PANEL RACK TO BE SUBMITTED TO THE DISTRICT FOR APPROVAL PRIOR TO FABRICATION.
7. SEE DISTRICT STANDARDS SECTIONS 11,12 & 13 FOR ADDITIONAL REQUIREMENTS
8. LARGER STATIONS WITH VFD MOTOR DRIVES AND LARGER/HEAVER PANELS WILL REQUIRE 8" RACK FRAMING

LOCATION OF CROSS -
SUPPORTS AS NEEDED,
BASED ON SIZE OF
ENCLOSURE.

ALUMINUM 6" STANDARD
CHANNEL,

ALL BOLTS, NUTS,
WASHERS, AND MISC.
HARDWARE SHALL BE
T-316 STAINLESS STEEL.



**JAMES ISLAND
PUBLIC SERVICE DISTRICT**

TYPICAL PUMP STATION
CONTROL PANEL

DRAWING:

19

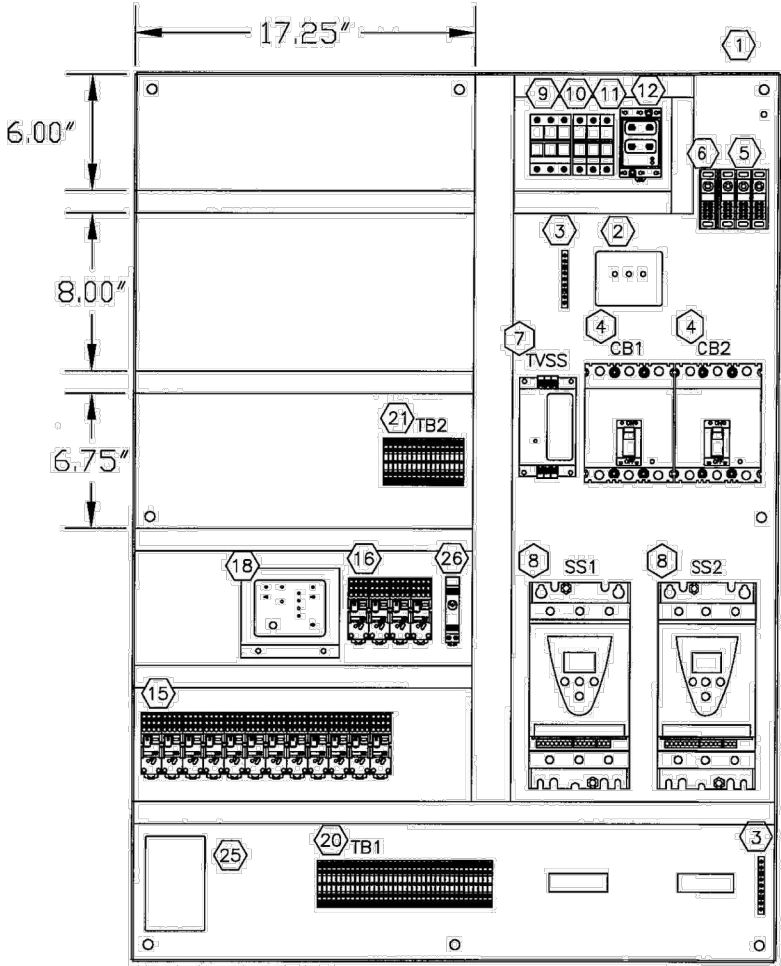
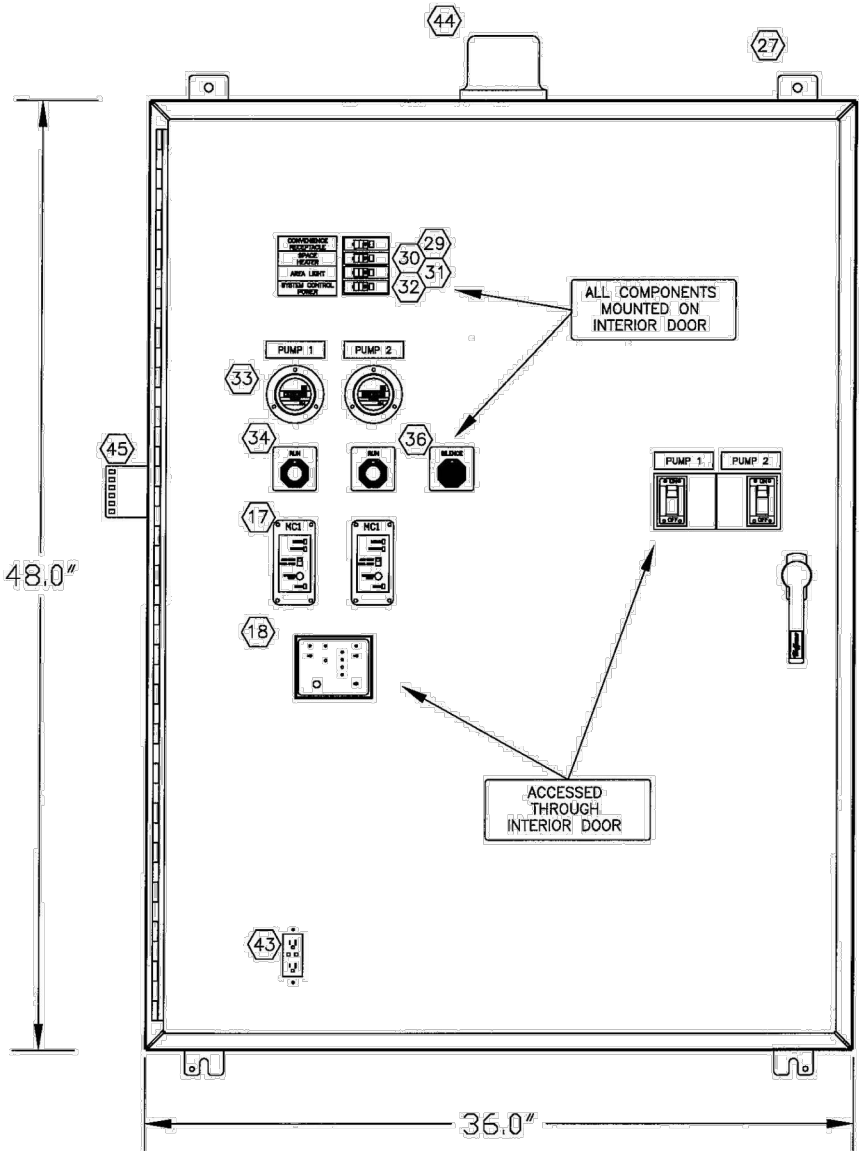
DATE: 05/24/16

DRAWN BY: GRG & ASSOC., INC

SCALE: NTS

APPROVED BY: DJH

BILL OF MATERIALS			
ITEM	QUAN	DESCRIPTION	MANUFACTURER
1	1	MOUNTING PANEL CAT# A48P36	HOFFMAN
2	1	LIGHTNING ARRESTER CAT# SDSA3650	SQUARE D
3	3	COPPER GROUND BAR CAT#PK7GTA	SQUARE D
4	2	30 AMP PUMP CIRCUIT BREAKERS CAT# FAL32030	SQUARE D
5	1	POWER DISTRIBUTION BLOCK CAT# 1323580	MARATHON
6	1	NEUTRAL DISTRIBUTION BLOCK CAT# 1321580	MARATHON
7	1	TVSS, 120 VAC CAT# HSP121BT-1RU	EDCO
8	2	SSRV STARTER, 5HP(230V) CAT# ATS22D32S6U	SQUARE D
9	1	FU1 3 POLE CLASS CC FUSE BLOCK / FUSES CAT# CHCC3D / FNR-1	BUSSMANN
10	2	FU2,3 1 POLE, CLASS M FUSE BLOCK / FUSES CAT# CHM1D / FNM-1	BUSSMANN
11	1	FU4 1 POLE, CLASS M FUSE BLOCK / FUSES CAT# CHM1D / FNM-1	BUSSMANN
12	1	PHASE LOSS & UNDERVOLTAGE RELAY CAT# 460-14	SYNCOM
13			
14			
15	12	120 VAC 4 POLE DT RELAY / BASE CAT# RXM4AB2F7 / RXZE2S114M	SQUARE D / SQUARE D
16	4	24VDC 4 POLE DT RELAY / BASE CAT# RXM4AB2BD / RXZE2S114M	SQUARE D / SQUARE D
17	2	PUMP PROTECTION RELAY / BASE CAT#MINICAS / RUZC3M	FLYGT / SQUARE D
18	2	DUPLEX PUMP CONTROLLER CAT# 010-120-122P	MPE ELECTRONICS
19			
20	31	TB1 TERMINAL BLOCKS CAT# 102010	WEIDMULLER
21	18	TB2 TERMINAL BLOCKS CAT# 102010	WEIDMULLER
22			
23			
24			
25	1	50 WATT SPACE HEATER CAT# AHC-50	INGRAM
26	1	HEATER THERMOSTAT CAT# 7T.B1.0.000.2403	FINDER
27	1	NEMA 4X, STAINLESS ENCLOSURE CAT# A48H3612SSLP3PTW	HOFFMAN
28			
29	1	CONVENIENCE RECEPTACLE BREAKER CAT# QOU115	SQUARE D
30	1	SPACE HEATER BREAKER CAT# QOU110	SQUARE D
31	1	AREA LIGHT BREAKER CAT# QOU115	SQUARE D
32	1	SYSTEM CONTROL POWER BREAKER CAT# QOU110	SQUARE D
33	2	ELAPSED TIME METER CAT# 711-0160	REDDINGTON
34	2	"DRIVE RESET" PUSHBUTTON CAT# 9001 SKR1BH6	SQUARE D
35	1		
36	1	"SILENCE" PUSHBUTTON CAT# 9001 SKR1BH6	SQUARE D
37			
38			
39			
40			
41			
42			
43	1	15 AMP GFI RECEPTACLE CAT# 15951	P&S
44	1	EXTERNAL ALARM LIGHT CAT# LRX40F	INGRAM
45	1	NEMA 4X ALARM HORN CAT# 85SP-B10LE22	ALLEN-BRADLEY



ENCLOSED UL LISTED TYPE 4X WITH WHITE POWDER COATED EXTERIOR

CONTROL PANEL WILL BE UL508A LISTED.

TYPICAL DUPLEX CONTROL PANEL 230/120 VOLT 3 PHASE 4W

FRONT ELEVATION & PANEL LAYOUT

11172 DOWNS ROAD
PINEVILLE, NC 28134
704-588-8288

NOTICE:

1. THE CONTROL PANEL EQUIPMENT AND CONFIGURATION INDICATED HEREON ARE JIPSD MINIMUM REQUIREMENTS FOR DUPLEX PUMP STATION OF NOMINAL SIZE.
2. ACTUAL EQUIPMENT REQUIREMENTS SHALL BE SIZED AND PROVIDED AS NECESSARY FOR THE APPLICABLE PUMP HORSEPOWER.
3. THE COMPONENT MANUFACTURER AND BASIC MODEL SHALL BE AS INDICATED, BUT SIZED AS REQUIRED FOR THE SPECIFIC PUMP INSTALLED.
4. PANELS FOR LARGER HORSE POWER VFD CONTROLLED PUMPS SHALL BE EQUIPPED WITH AN APPROPRIATELY SIZED, DISTRICT APPROVED SIDE-MOUNTED HOFFMAN AIR CONDITIONER UNIT.

JAMES ISLAND
PUBLIC SERVICE DISTRICT

PUMP STATION
DUPLEX PUMP CONTROL PANEL

DRAWING:
20

DATE: 05/24/16

DRAWN BY: GRG & ASSOC., INC

SCALE: NTS

APPROVED BY: DJH

ALUMINUM PLAT WITH PUMP
INFORMATION STAMPED IN
PLATE TO BE ATTACHED TO
INSIDE OF CONTROL PANEL
DOOR IN PLAIN VIEW.

PUMP H.P. _____
CAPACITY GPM _____
TOTAL DYNAMIC HEAD _____
OPERATING RPM _____
IMPELLER NO. _____
VOLTS _____
AMPS (RUNNING/STARTING) _____ / _____
PHASE _____
MANUFACTURER _____
MODEL NO. _____
SIN #1 _____ SIN #2 _____
CONTRACTOR _____
DATE _____

NOTICE:

A SCHEMATIC FOR THE CONTROL PANEL COMPONENTS, LAMINATED ON BOTH SIDES, SHALL BE PLACED IN A POCKET ATTACHED TO THE INSIDE OF THE PANEL DOOR. THE ABOVE PUMP AND MOTOR INFORMATION PLATE SHALL BE PERMANENTLY AFFIXED TO THE INSIDE OF THE PANEL DOOR.

**JAMES ISLAND
PUBLIC SERVICE DISTRICT**

CONTROL PANEL
INFORMATION PLATES

DRAWING:

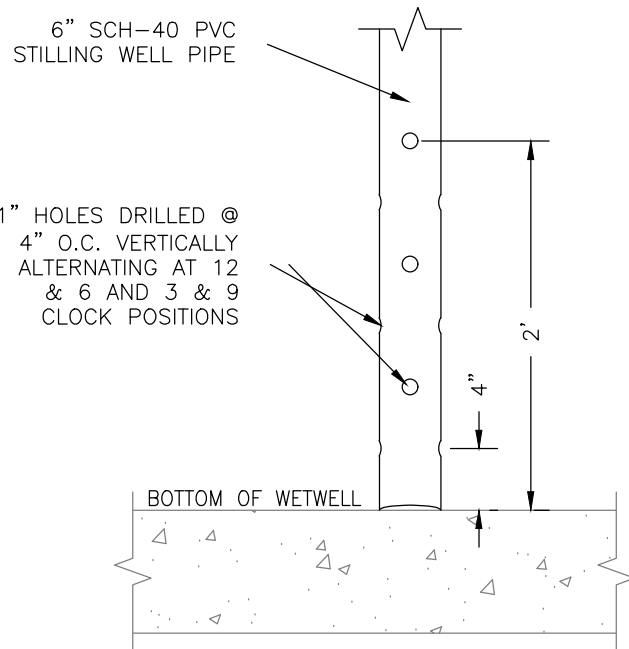
21

DATE: 05/24/16

DRAWN BY: GRG & ASSOC., INC

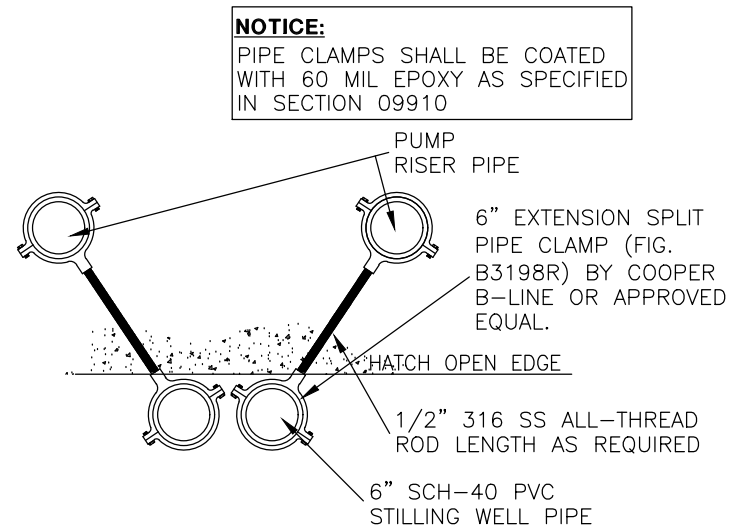
SCALE: NTS

APPROVED BY: DJH



STILLING WELL HOLE PATTERN

NOT TO SCALE



STILLING WELL PIPE BRACING

NOT TO SCALE

JAMES ISLAND PUBLIC SERVICE DISTRICT			
PRESSURE TRANSDUCER STILLING WELL			DRAWING: 22
DATE: 05/24/16		DRAWN BY: GRC & ASSOC., INC	
SCALE: NTS		APPROVED BY: DJH	

AIR RELEASE VALVE, MANUFACTURED BY ARI, MODEL D-025 AUTOMATIC AIR RELEASE VALVE WITH 2" NPT INLET SIZE. BACKWASH FITTINGS AND BALL VALVES REQUIRED. PAINT AS SPECIFIED FOR EXTERIOR PIPING.

PRESSURE GAUGE: STAINLESS STEEL, SILICON OIL FILLED, OMEGA MODEL PGM-100L SERIES OR APPROVED EQUAL.

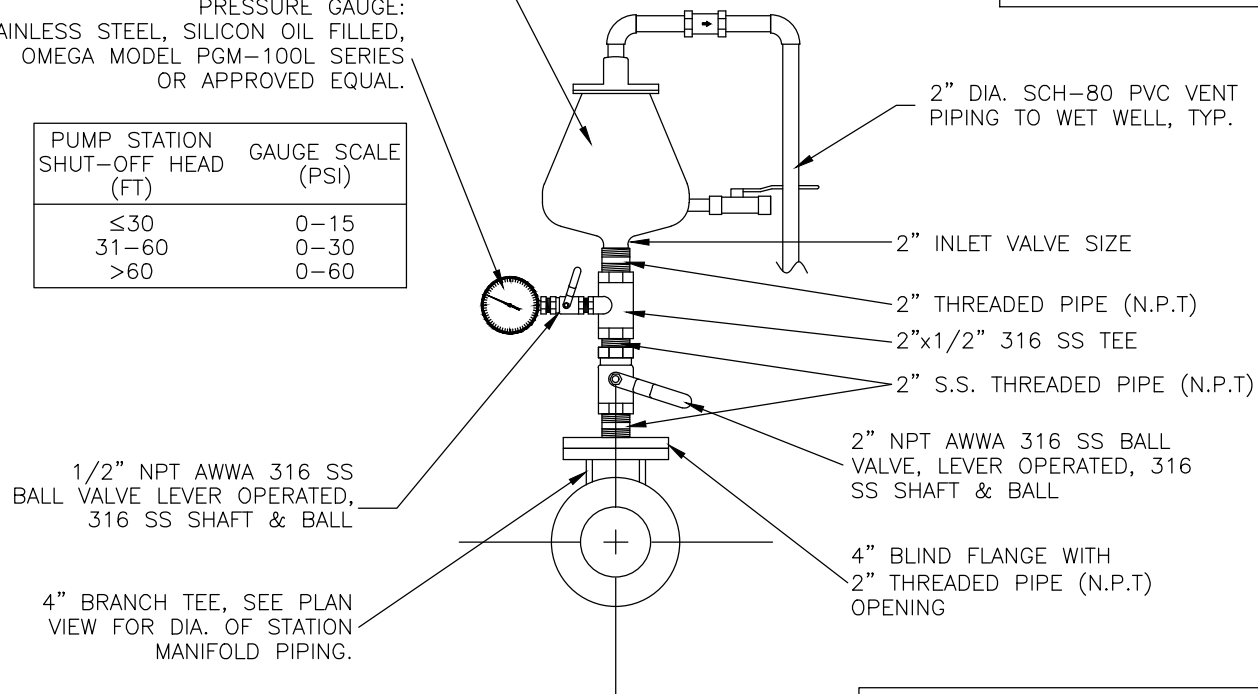
PUMP STATION SHUT-OFF HEAD (FT)	GAUGE SCALE (PSI)
≤30	0-15
31-60	0-30
>60	0-60

NOTE:

VALVE SHALL BE EQUIPPED ARI CHECK VALVE FOR AIR RELEASE ONLY

NOTICE

DO NOT PAINT STAINLESS STEEL PIPING, VALVES, FITTINGS AND GAUGES



**JAMES ISLAND
PUBLIC SERVICE DISTRICT**

PUMP STATION PIPING AIR RELEASE VALVE

DRAWING:

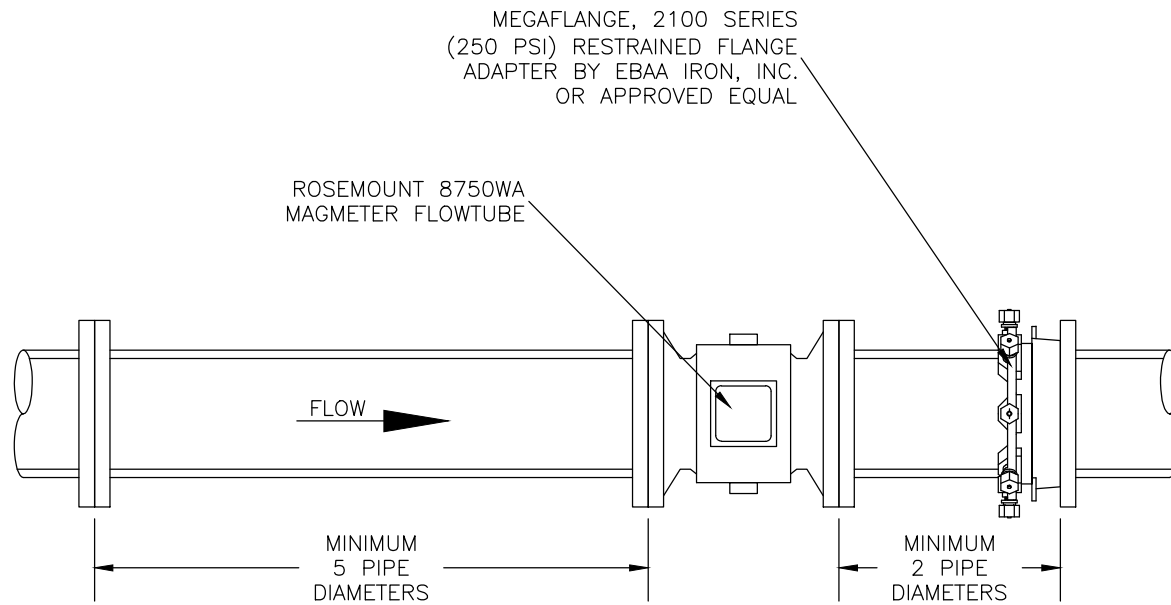
23

DATE: 05/24/16

DRAWN BY: GRG & ASSOC., INC

SCALE: NTS

APPROVED BY: DJH



**JAMES ISLAND
PUBLIC SERVICE DISTRICT**

PUMP STATION FLOW METER

DRAWING:

24

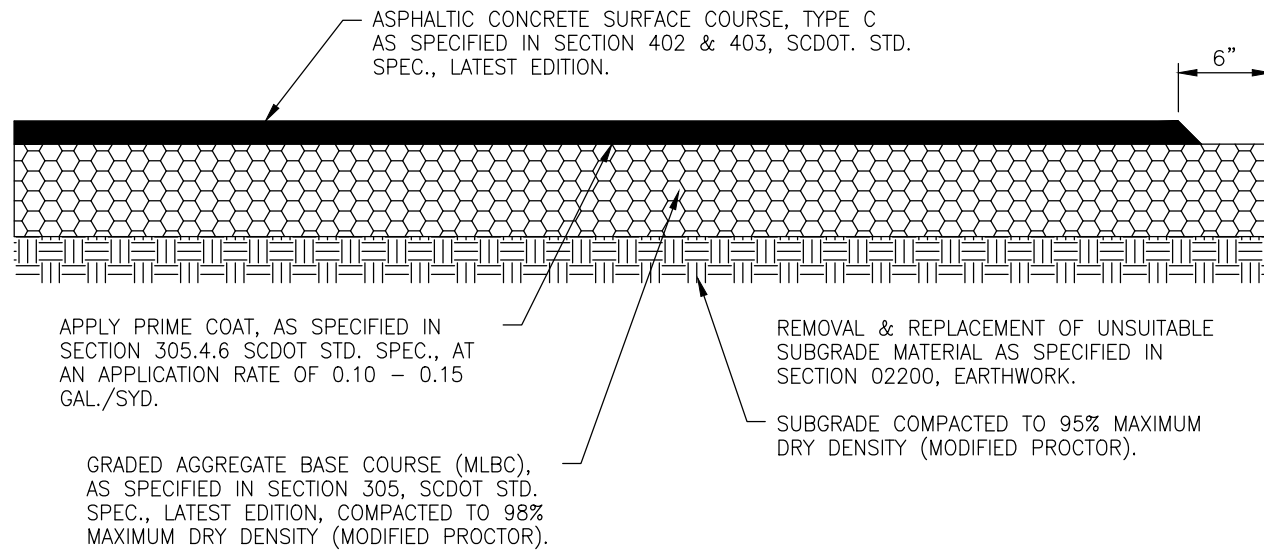
DATE: 05/24/16

DRAWN BY: GRC & ASSOC., INC

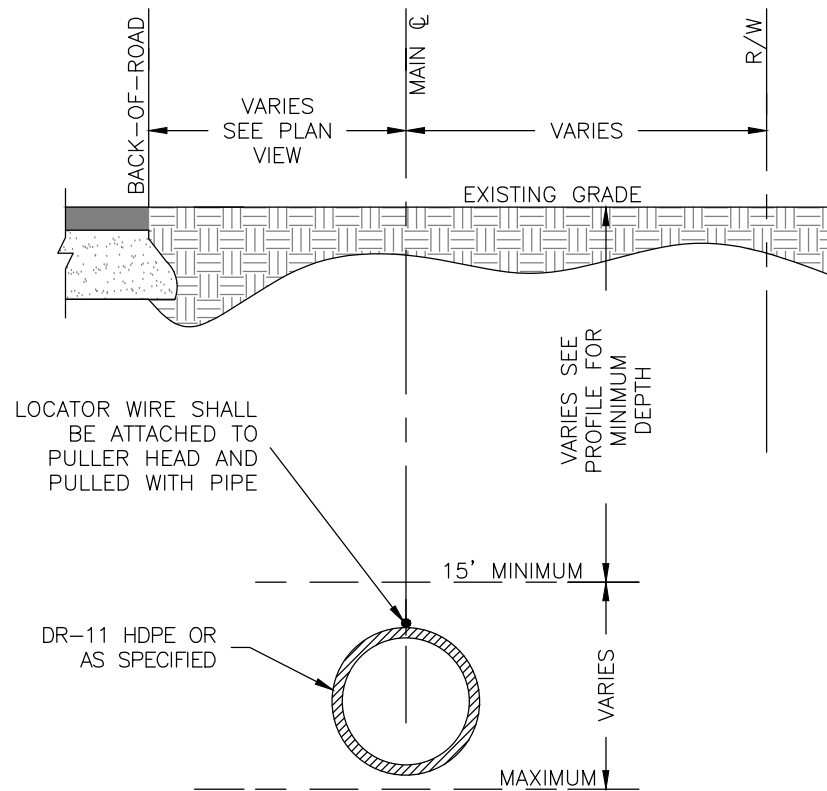
SCALE: NTS

APPROVED BY: DJH

	S.A.B.C.	A.C.
REGULAR DUTY	8"	2"



JAMES ISLAND PUBLIC SERVICE DISTRICT			
TYPICAL PUMP STATION ASPHALT DRIVEWAY SECTION			DRAWING:
			25
DATE: 05/24/16		DRAWN BY: GRG & ASSOC., INC	
SCALE: NTS		APPROVED BY: DJH	



**JAMES ISLAND
PUBLIC SERVICE DISTRICT**

HORIZONTAL DIRECTIONAL DRILLING (HDD)
FORCEMAIN SECTION

DRAWING:

27

DATE: 05/24/16

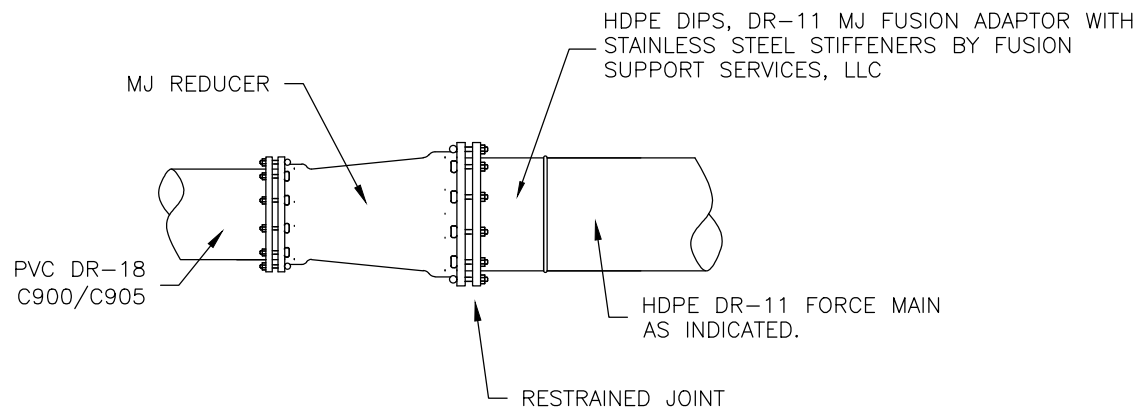
DRAWN BY: GRG & ASSOC., INC

SCALE: NTS

APPROVED BY: DJH

NOTICE:

ALL DUCTILE IRON PIPE AND FITTINGS SHALL BE P-401 LINED AND ENCASED IN POLYETHYLENE AS REQUIRED PURSUANT TO APPLICABLE PROJECT SPECIFICATIONS AND IN ACCORDANCE WITH AWWA C105.



**JAMES ISLAND
PUBLIC SERVICE DISTRICT**

HDPE TRANSITION

DRAWING:

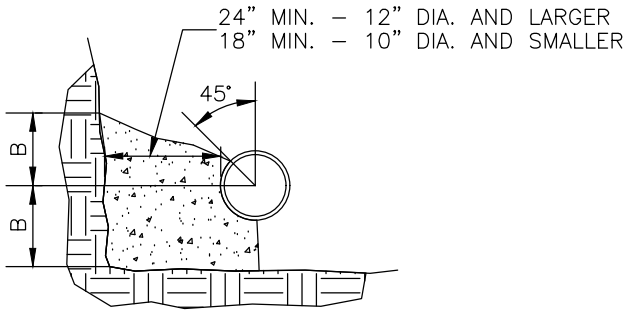
28

DATE: 05/24/16

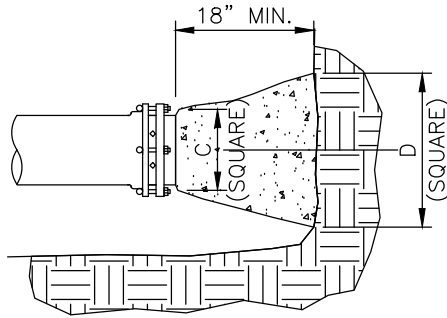
DRAWN BY: GRG & ASSOC., INC

SCALE: NTS

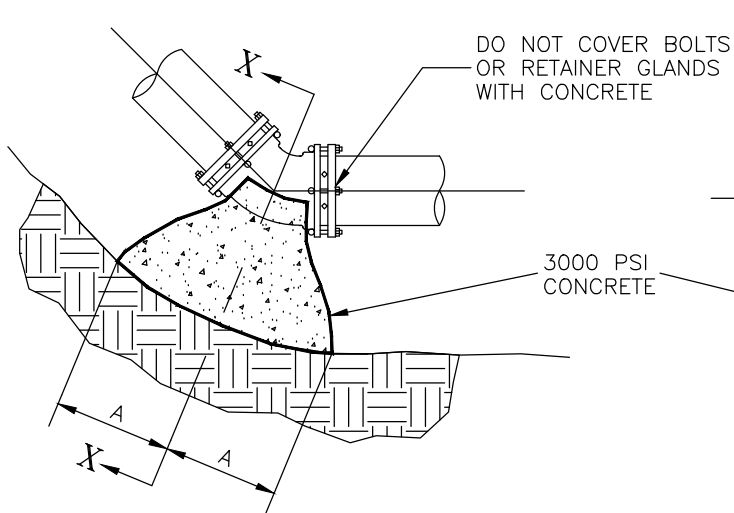
APPROVED BY: DJH



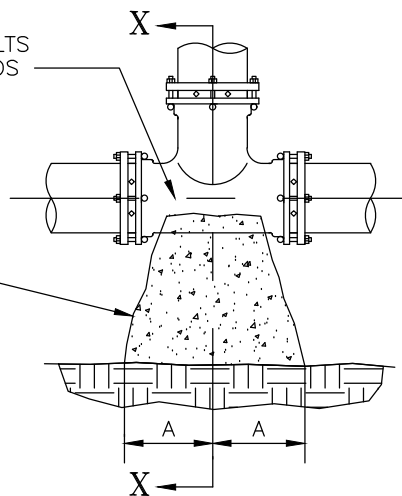
**SECTION X-X
BENDS & TEES**



PLUGS - PLAN & ELEVATION VIEW



BENDS - PLAN VIEW



TEE - PLAN VIEW

MINIMUM SOIL BEARING CAPACITY	DIA.	90° BEND		45° BEND		22° BEND		TEES		PLUGS	
		A	B	A	B	A	B	A	B	A	B
4000 PSF	6"	8"	10"	6"	8"	3"	8"	8"	8"	10"	15"
	8"	12"	12"	8"	10"	5"	9"	9"	12"	12"	20"
	10"	16"	14"	10"	12"	6"	10"	11"	14"	14"	25"
	12"	19"	16"	12"	14"	8"	11"	14"	16"	16"	30"
	14"	23"	18"	14"	16"	10"	12"	16"	18"	18"	34"
	16"	26"	20"	16"	18"	11"	13"	18"	20"	20"	38"
2000 PSF	6"	16"	10"	9"	10"	6"	8"	10"	12"	10"	21"
	8"	22"	13"	12"	13"	8"	10"	13"	16"	12"	29"
	10"	26"	17"	14"	17"	10"	13"	16"	20"	14"	36"
	12"	29"	21"	16"	21"	11"	16"	18"	24"	16"	41"
	14"	35"	24"	19"	24"	12"	20"	22"	27"	18"	48"
	16"	38"	27"	21"	27"	12"	24"	24"	30"	20"	54"

NOTE: FOR 2"-4" DIAMETER WATER LINES USE DIMENSIONS INDICATED FOR 6" MAINS

**JAMES ISLAND
PUBLIC SERVICE DISTRICT**

THRUST BLOCKING

DRAWING:

29

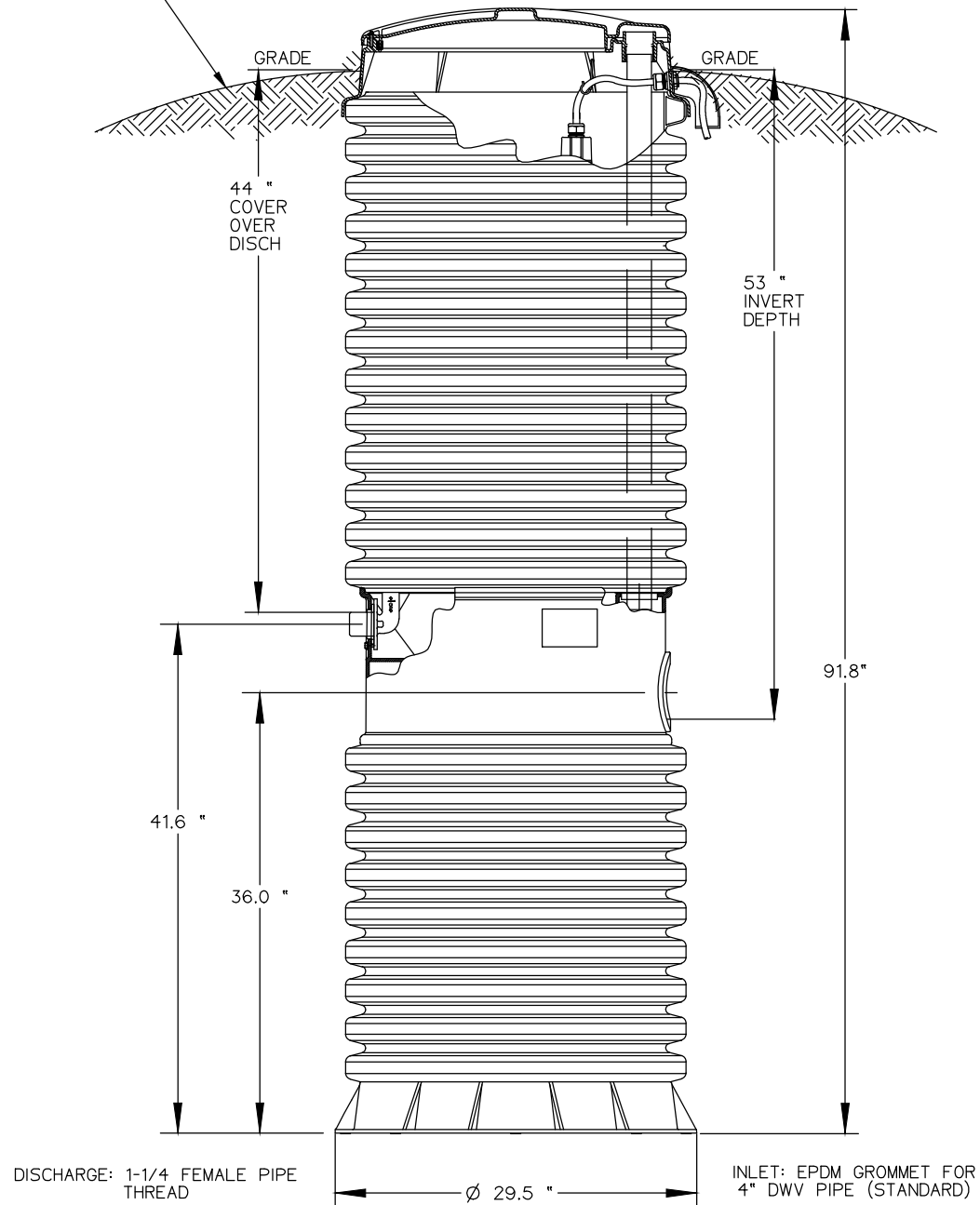
DATE: 05/24/16

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SCALE: NTS

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GRADE MUST SLOPE
AWAY FROM STATION



SEE GRINDER PUMP INSTALLATION DETAIL
FOR CONCRETE ANCHOR REQUIREMENT

NOTE: DIMENSIONS ARE FOR REF ONLY



e one
SEWER SYSTEMS

MODEL DH071-93

NA0050P06

**JAMES ISLAND
PUBLIC SERVICE DISTRICT**

GRINDER PUMP

DRAWING:

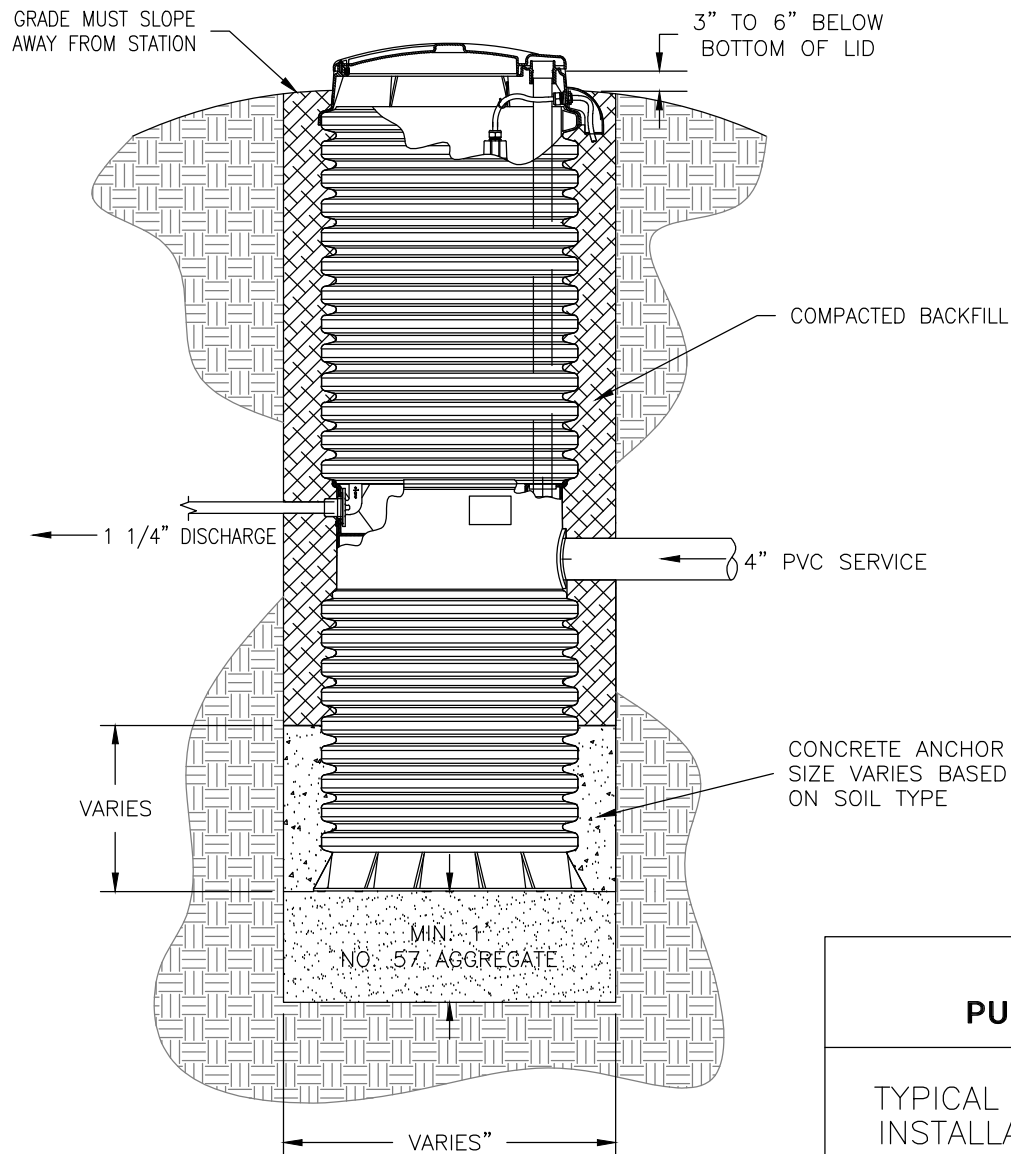
30

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**JAMES ISLAND
PUBLIC SERVICE DISTRICT**

TYPICAL GRINDER PUMP
INSTALLATION

DRAWING:

31

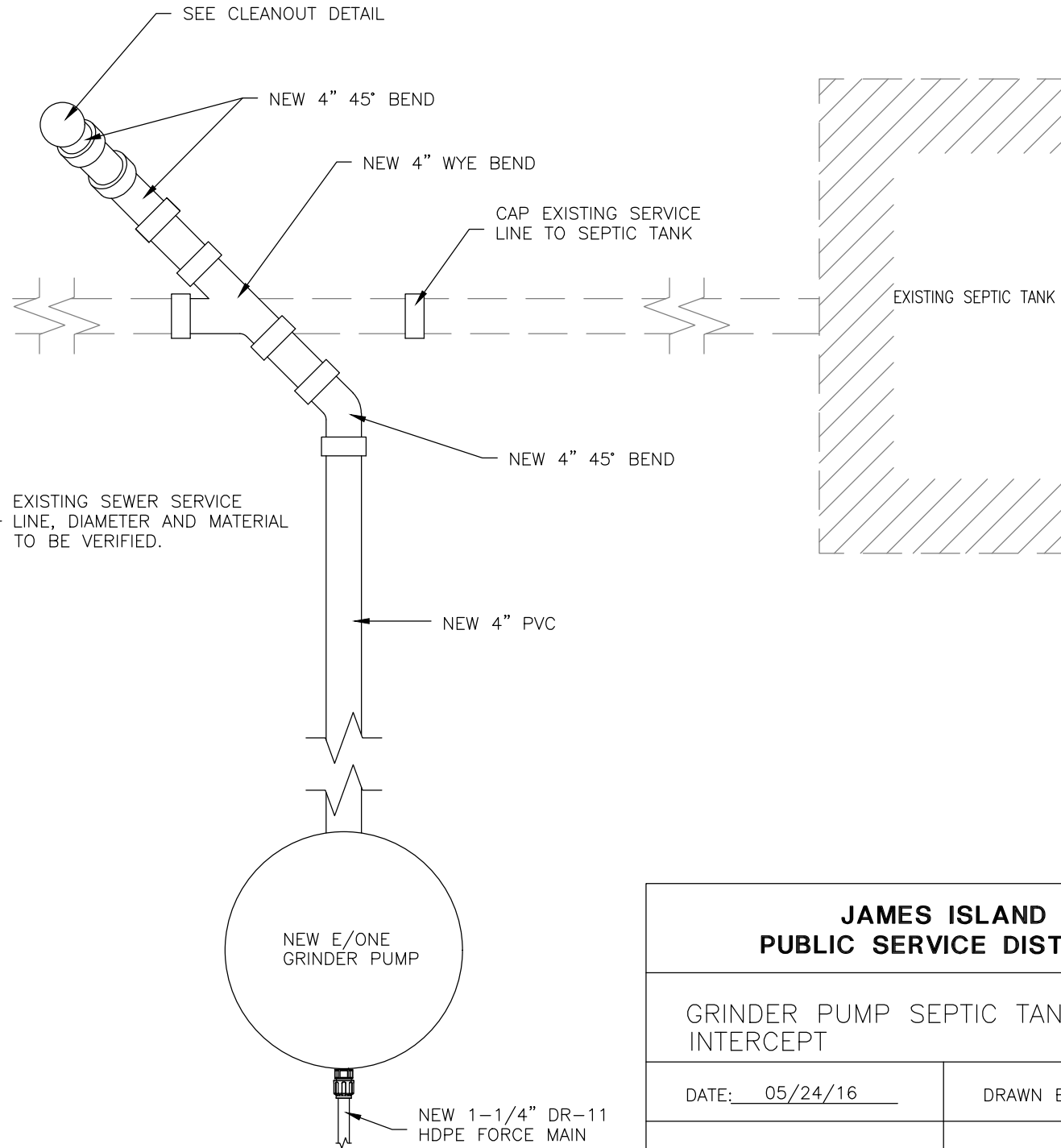
DATE: 05/24/16

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EXISTING HOUSE



**JAMES ISLAND
PUBLIC SERVICE DISTRICT**

GRINDER PUMP SEPTIC TANK
INTERCEPT

DRAWING:

32

DATE: 05/24/16

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SCALE: NTS

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LID ASSEMBLY WITH PENTAGON HEAD PLUG
MATERIAL: CAST IRON

EXTENSION TYPE CURB BOX WITH ARCH PATTERN BASE BY E/ONE

AVAILABLE LENGTHS

18-30"
30-42"
36-54"
42-66"
48-78"
60-102"

PART NUMBER
PB0930G01
PB0930G02
PB0930G03
PB0930G04
PB0930G05
PB0930G06

ORDERED SEPARATELY USING PART NUMBER FROM ABOVE

3"x1-1/4" ROMAC INDUSTRIES,
INC. 202N-H SERVICE SADDLE
OR APPROVED EQUAL

3" HDPE IPS
DR-11 FORCE
MAIN

1-1/4" MALE THREADED
ADAPTER COMPRESSION
FITTING

NEW 1-1/4" DR 11
HDPE FORCE MAIN
FROM GRINDER PUMP

2"x1-1/4" ROMAC INDUSTRIES,
INC. 202N-H SERVICE SADDLE
OR APPROVED EQUAL

2" HDPE IPS
DR-11 FORCE
MAIN

1-1/4" STAINLESS STEEL
UNI-LATERAL LATERAL
VALVE BY E/ONE PART
NUMBER NB018P01

JAMES ISLAND PUBLIC SERVICE DISTRICT

GRINDER PUMP SERVICE
CONNECTION

DRAWING:

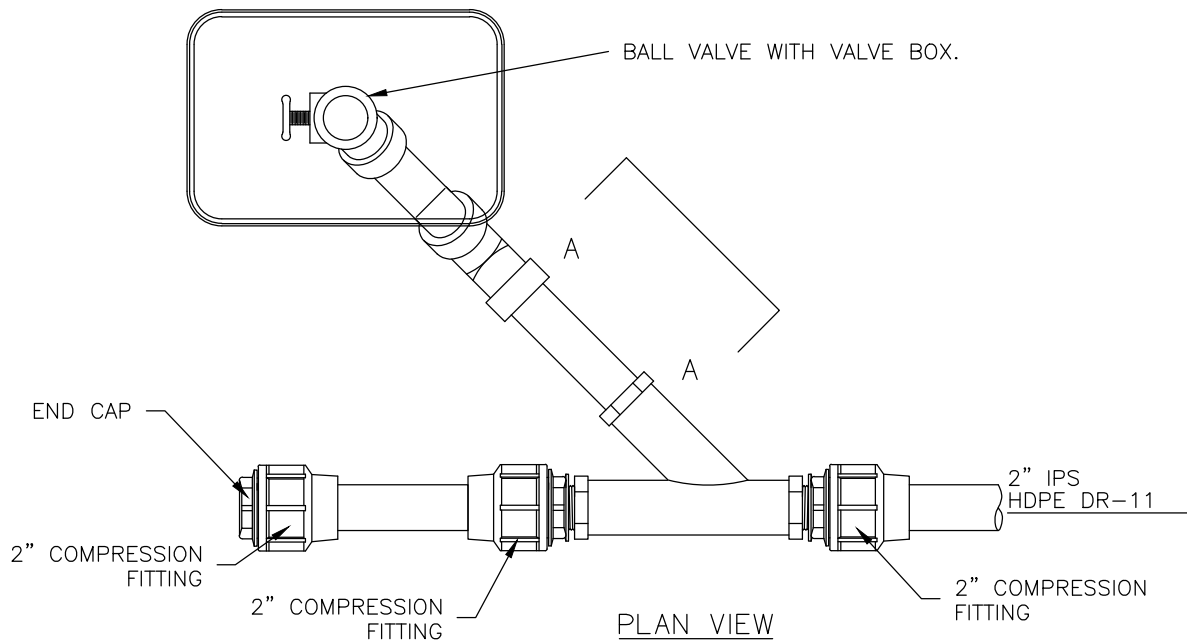
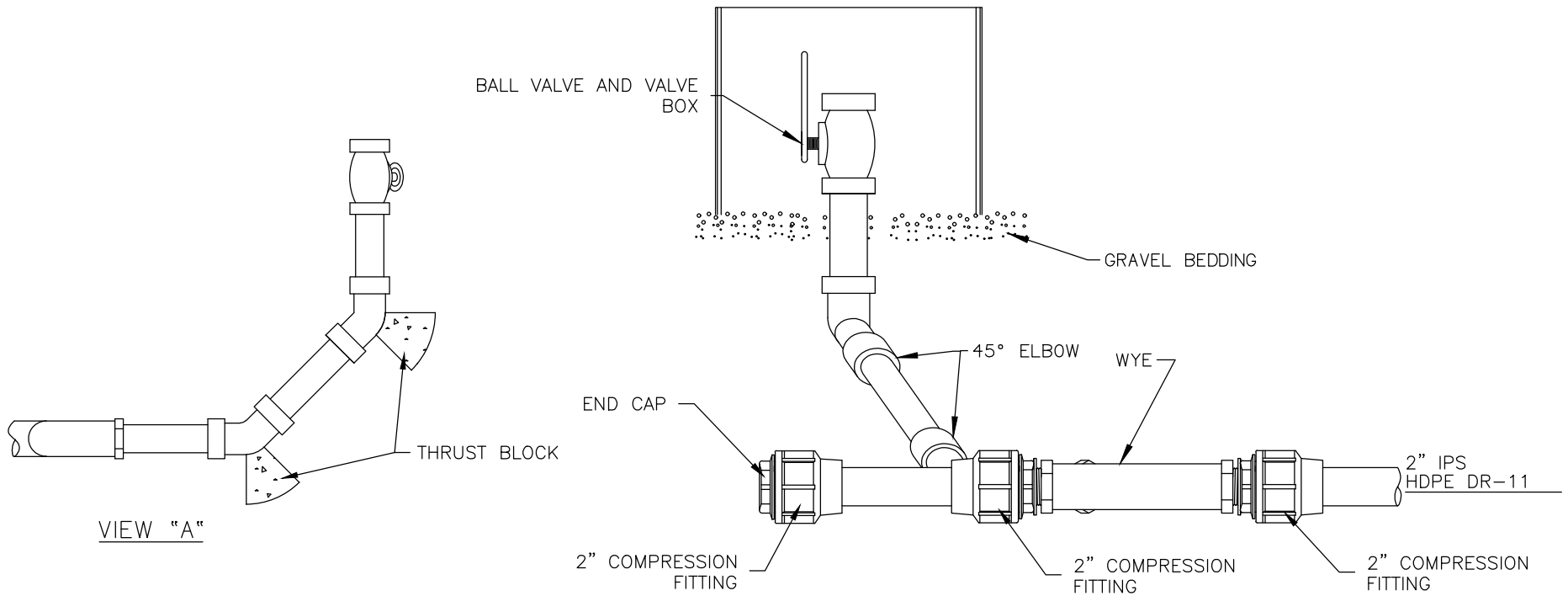
33

DATE: 05/24/16

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SCALE: NTS

APPROVED BY: DJH



**JAMES ISLAND
PUBLIC SERVICE DISTRICT**

LOW PRESSURE FORCE MAIN
END-OF-LINE FLUSHING

DRAWING:

34

DATE: 05/24/16

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SCALE: NTS

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20.

JIPSD APPROVED
MATERIAL MANUFACTURERS

SECTION 20

JIPSD APPROVED MATERIAL MANUFACTURERS

PART 1 – GENERAL

- A. Ductile Iron Pipe and fittings:
 - 1. American
 - 2. US Pipe
 - 3. Griffin
 - 4. Clow

- B. Ductile Iron Fittings:
 - 1. Flange Fittings:
 - a. US Pipe (TR Flex series)
 - b. American
 - c. Tyler-Union
 - d. Star
 - e. Sigma
 - 2. Mechanical Joint Fittings:
 - a. US Pipe (TR Flex series)
 - b. American
 - c. Tyler-Union
 - d. Star
 - e. Sigma
 - f. Griffin

- C. Ductile Iron Lining:
 - 1. Protecto-401
 - 2. Permox CTF

- D. Compression sleeve coupling:
 - 1. Smith-Blair (411 Series with SS nuts and bolts)
 - 2. Romac (Armor Series SS)

- E. Transition Couplings:
 - 1. Dresser (Style 62 with SS nuts and bolts)
 - 2. Fernco (5000 Series with SS nuts and bolt clamps)
 - 3. Smith-Blair (Style 413 with SS nuts and bolts)

- F. Polyethylene encasement tape:
 - 1. Kendall (Polyken 900)
 - 2. 3M (Scotchrap 50)

- G. Joint Restraint:
1. DIP:
 - a. Ebaa Iron 1100 Series Megalug
 - b. Ford Series 1400
 - c. Romac RomaGrip
 - d. Sigma ONE-LOK Series SLDE
 - e. StarGrip Series 3000
 2. PVC:
 - a. Ebaa Iron 2000PV Series
 - b. Ford Series 1350, 1390, 1500
 - c. Romac RomaGrip for PVC
 - d. Sigma ONE-LOK Series SLCE
 - e. StarGrip PVC Series 4000
 3. HDPE:
 - a. EBAA HDPE Joint Restraint
 - b. StarGrip Series 4000 Restrainer for HDPE

PART 2 – WASTEWATER

- A. Force Main Valves:
1. Plug Valves:
 - a. Milliken Millcentric Series 600FP 100% Port
 - b. Milliken Millcentric Series 600
 - c. DeZurick PEF 100% Port
 - d. DeZurick PEC
 - e. Pratt Ballcentric 100% Port
 - f. Val-Matic Cam-Centric 100% Port
 - g. Clow Eccentric Plug Valve
 2. Gate Valves:
 - a. Mueller A-2361
 - b. American Flow Series 2500
 - c. Clow Model2638
 3. Check Valves:
 - a. Tideflex Red Valve Series 39
 - b. Wastop Inline Check Valve
 - c. Mueller Flexible Disc
 - d. Val-Matic Swing-Flex (VM-502A)
 - e. Crispin RF Series
 - f. American Flow Control Series 2100
- B. Manhole:
1. Knights PreCast
 2. Tindall Concrete G Series

- C. Manhole Castings:
 - 1. Castings in Vehicle Traffic Areas
 - a. US Foundry
 - b. East Jordan
 - 2. Casting not in Vehicle Traffic Areas
 - a. Pamrex
 - b. East Jordan

PART 3 – PUMP STATIONS

- A. Pumps:
 - 1. Grinder
 - a. ABS Piranha
 - b. Environment One (E-1)
 - 2. Centrifugal
 - a. Flygt
 - b. ABS
- B. Valves:
 - 1. Plug:
 - a. Milliken Milcentric Series 601FP 100% Port
 - b. Milliken Milcentric Series 601
 - c. DeZurick PEF 100% Port
 - d. DeZurick PEC
 - e. Pratt Ballcentric 100% Port
 - f. Val-Matic Cam-Centric 100% Port
 - g. Clow Eccentric Plug Valve
 - 2. Gate:
 - a. Mueller A-2361
 - b. American Flow Series 2500
 - c. Clow Model 2638
 - 3. Ball Check:
 - a. HDL Type 5087
 - b. Flowmatic Model 408
 - 4. Inline Check:
 - a. Tideflex Red Valve Series 39
 - b. Wastop Inline Check Valve
 - c. American Flow Control Series 2100
- C. Air Release Valves:
 - 1. ARI Model D-020, D-023, D-025
 - 2. ARI Automatic air release valve Model S-020
 - 3. H-Tec Model 986-01

- D. Access Hatch:
 - 1. Halliday Series F1R Floodtight Hatch
 - 2. East Jordan Floodproof Hatch

- E. Riser Pipe Coupling:
 - 1. Body (316 SS):
 - a. Dresser Style 38
 - b. Smith Blair 411
 - 2. Gasket Compound:
 - a. Grade-42 Buna-N

- F. Wall Seals:
 - 1. Link-Seal Model Series LS

- G. Pipe Supports/Hangers:
 - 1. Grinnel

- H. Inside Drop Connections:
 - 1. Reliner Inside Drop Bowls

- I. Wet Wells:
 - 1. Knights
 - 2. Tindall Concrete G Series

- J. Coatings:
 - 1. Raven 405 (60 mils minimum piping and 125 mils minimum concrete)

- K. Linings:
 - 1. Strong-Seal 100% Calcium Aluminate (minimum 0.50 inches)

- L. Flow Meters:
 - 1. Rosemount Series 8700 Flowtube & Series 871 Transmitter