

JAMES ISLAND PUBLIC SERVICE DISTRICT



Sanitary Sewer System

Design and Construction Standards

January 2010

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JAMES ISLAND PUBLIC SERVICE DISTRICT

SANITARY SEWER SYSTEM

DESIGN AND CONSTRUCTION STANDARDS

INDEX

RESOLUTION

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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**” can be obtained from the District.

These standards will be subject to updates on a periodic basis. Only those individuals or companies who are on record of having a copy of the standards will be furnished revisions. Pages are dated and numbered to assist in the maintenance of current information.

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 Manager 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.

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.

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 put into service until the permit to operate as issued by the South Carolina Department of Health and Environmental Control (SCDHEC) is received by the District.
4. The District shall have exclusive retail rights.
5. 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 Superintendent at (843) 795-9060 ext.114.
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 should include:
 - i. Complete system design
 - 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. For all commercial developments, location of all proposed water and sewer services and size
 - v. 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 installation 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 and Specifications 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 and other required permit applications completed and ready for final approval and signature. All 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 should be coordinated in advance with the District's Wastewater Superintendent.
- e. A pre-construction conference must be held with the District. The District will require copies of the Contractor's safety training certifications and insurance certificates.

D. SHOP DRAWINGS

1. The District may review 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. Make shop drawings accurately to a scale 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 six (6) 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.
 - 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 pump curves.
- 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 approved Plans, Specifications, applicable permits and good engineering practice.
 - b. Two (2) sets of prints and one (1) set of white mylar reproducible (not sepia mylar) of "**As Constructed Record Drawings**". These drawings shall reflect 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 and termination points.
 - 3) Valves are to be located by distance to two permanent reference points.
 - 4) Indicate top elevation of manholes and invert elevation of manholes.

- 5) Reference benchmarks on drawings and tie to National Geodetic Vertical Datum of 1929 (NGVD29).
 - 6) Show all recorded plat and easement information on the mylar plan.
 - 7) Drawings must be clearly legible and of good quality.
 - 8) 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 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 four (4) prints and two (2) recordable white mylars of the easement plats. Each must have original signature and seal (do not use sepia mylar and no larger than 22" x 34") as prepared in accordance with requirement set by the District and the RMC Office. Further, the easement plat is to be accompanied by a right-of-way easement instrument of conveyance. The Developer will record all easements and plats. The District will not accept compiled maps as land surveys. The width of the easements for sewer mains shall be a minimum of twenty (20) feet. 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. **Plats cannot be accepted unless these requirements are met.**
- g. The Developer shall furnish Certified Contractor's Affidavit and Final Waiver of Lien.

2. Once the above items have been submitted, conduct an on-site final inspection with the District's Wastewater Superintendent to ensure that all construction complies with these guidelines and all sanitary sewer mains 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 letter allowing the systems to be placed into operation has been received, NO CONNECTIONS TO THE SYSTEMS WILL 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, CHARLESTON, SC 29412
PHONE: (843) 795-9060 FAX: (843) 762-5240**

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" dated 1990.
- F.____ One (1) original and seven (7) copies of all applicable sewer/forcemain 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 seven (7) copies of each Roadway Encroachment Permit Application required indicating the District as Applicant; submittals will be processed by the District.
- 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 y 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.

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 by The District _____ _____

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 District Fees; Amount \$ _____ _____ _____

H. Preconstruction Conference;
Date Scheduled: _____ _____ _____

I. Identity of Resident Inspector

Phone #: _____ _____ _____

J. Identity of Job Site Superintendent

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	_____	_____
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: _____

	<u>APPROVED</u>	<u>DATE</u>
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)	_____	_____

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 when possible.
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 sewer mains within the easement shall be platted so as to provide equal distance on each side.
8. Structures are not permitted within the easement.
9. Water and sewer mains are not 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 treatment is specifically approved by the District. Adhere to all applicable tree ordinances.

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. SEWER PIPES

1. Straight alignment.
2. Depth adequate to receive wastewater from the lowest service and prevent freezing.
3. Slopes greater than 20%.
 - a. Anchor using concrete anchors.
4. Where a smaller sewer joins a larger one, match the crowns of each.
5. Service laterals: Locate one (1) foot from property pin from opposite corner of water service lateral 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: 30".
 - b. 8" and above: 36".
 - 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 minimum as in Part G above.
 - e. The District reserves the right to require ductile iron pipe in specific locations.

I. MANHOLES

1. Maximum manhole spacing: 400 feet.
2. Minimal angle between sewer mains intersecting at manhole: 90°.
3. All manhole covers shall be watertight.
4. Use outside drop manholes where the difference in incoming and outgoing pipe elevation is two (2) feet or greater.

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 C900/C905 is required by the District.
 - c. On depths of 12 feet to 16 feet, use PVC C900/C905, or DIP.
 - d. On depths greater than 16 feet, use DIP as specified below.
2. Ductile-iron pipe and fittings (DIP):
 - a. Ductile iron pipe shall be Pressure Class 350 (4" – 12") or Pressure Class 250 (14" – 20") with a standard outside coating of coal tar or asphalt base material and inside lining as defined below. 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 Novalac Epoxy polymeric lining, 40 mils nominal thickness.
 - 2) Acceptable products:

- a) Protecto 401 Ceramic Epoxy Vulcan Painters, Birmingham, Alabama, Permite Permox 9430 Type II or approved equal Polyethylene lining 40 mils nominal thickness.
 - 3) Provide polyethylene encasement of all Ductile Iron pipe and fittings. Minimum nominal thickness of 8 mils conform to AWWA C105.
 - f. When transition is required from PVC sewer main to ductile iron pipe sewer main, mechanical joints will be used. No Fernco couplings will be allowed.
 - g. All DIP gravity line 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, be green on top, and be 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 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 line 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, be green on top, and be 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 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 thickness 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"

- 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. The frame and cover shall also meet ASSHTO-H20 loading requirements. The frame shall have a clear opening of 24" and shall be 4" high. Cover shall sit on a polyethylene gasket and lock automatically. 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. Castings which have been plugged or otherwise repaired shall be unacceptable for use. The contact surface between the cover and supporting ring shall be machined to make contact on the complete perimeter.
 - b. Frames and covers shall be heavy duty Ductile Iron Class 400 PAMREX Model 621131.I. 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. Use cement brick for adjustments less than 4". The total number of grade rings shall not exceed 8" in thickness. 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 above finished grade and properly bonded to the masonry with non-shrinking cement grout or hydraulic cement. Where manholes are constructed in paved areas, sidewalks, etc., the top surface of the frame and cover shall be tilted so as to conform to the exact slope crown and grade of the existing pavement.
- 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. It shall be similar in construction to the standard 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 sand-clay, fine sand or sand gravel mixes with a maximum of 25% passing a wash #200 sieve.
3. Manhole Bedding Materials
- a. Shall be crushed stone as noted in Section D.1.a.

E. CASING, SPACERS AND END SEALS FOR UTILITIES

1. General
- a. Provide bore and jack 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) if the carrier pipe is less than 6" in diameter. If 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.
 - c. Minimum wall thickness as follows:

<u>Diameter of Casing (Inches)</u>	<u>Minimum Wall Thickness (Inches)</u>
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 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.

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.

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. Maximum trench widths, depths and bedding methods.

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

b. Ductile-iron pipe:

MAXIMUM DEPTHS IN FEET			
			Class of Bedding
			B
PIPE SIZE	MAX. TRENCH WIDTH	PRESSURE CLASS	TYPE 1 OR TYPE 2
8"	2'2"	350	20
10"	2'4"	350	20
10"	2'4"	350	20
12"	2'6"	350	20
12"	2'6"	350	20
12"	2'6"	350	20
14"	2'9"	250	20
14"	2'9"	250	20
14"	2'9"	250	20
16"	3'0"	250	20
16"	3'0"	250	20
16"	3'0"	250	20
18"	3'2"	250	20
18"	3'2"	250	20
18"	3'2"	250	20
20"	3'6"	250	20
20"	3'6"	250	20
20"	3'6"	250	20

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

MAXIMUM DEPTHS IN FEET		
		Class of Bedding
		B
PIPE SIZE	MAX. TRENCH WIDTH	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 (Ductile iron pipe only):

- 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) Gravity sewer pipe installation must comply with ANSI/ASTM D2321 as the minimum acceptable standard as well as any additional requirements as stated herein.
- 3) 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.
- 4) 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.
- 5) 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.
- 6) Each joint shall be laid so that it will form a close concentric joint with adjoining pipe and so as to avoid sudden offsets.
- 7) All jointing of pipe and fittings shall be in accordance with the pipe manufacturer's recommendations.
- 8) 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.
- 9) 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.

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 bells and spigots.

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.

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. Provide in all manholes (new or existing) where directed by the District and in all junction manholes where a force main enters and in the next manhole down stream.
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 coating:
 - 1) Coatings meeting ASTM Standards, F-2551-9, C307, C508, as approved by the District.
 - 2) 240 mils Neopoxy NPL-5300, when directed by the District.
 - 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 main sewer line and service lateral are the same elevation.
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 from property corner on opposite corner of water lateral when feasible.
10. Minimum cover required by SCDOT and the District of service lateral is 24". 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. 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.

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 manholes shall be to final grade, have no visible infiltration, contain properly formed and sloped inverts, and be properly coated as outlined in previous sections. 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 video inspection of all lines at the Developer's expense. Two copies on CD's will be required for review.
- b. The Developer can 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. 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.

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.

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 ft	300 ft	350 ft	400 ft	450
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
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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 strength 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 lots. In no case is the clean-out to be placed within 15' of the building it is serving.
- 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 recommendations. Pipe shall be stored on a smooth surface to avoid point loadings. Pipe shall be handled with care so as to prevent damage. 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 recommended by the manufacturer. 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, 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 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.
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. 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. 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. Comply with all OSHA guidelines.

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 500 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 road base and asphalt shall be in accordance with South Carolina District of Transportation (SCDOT) regulations.
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. Seal each end with brick and mortar to prevent the entrance of foreign material.
10. 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.

SECTION 8
PRESSURE SEWER (FORCE MAIN)
DESIGN STANDARDS

A. GENERAL

1. The following pressure 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 sewer service from the District.

B. PRESSURE SEWER DESIGN CRITERIA

1. Minimum pipe size: 2".
2. Design velocity.
 - a. Minimum: 2 feet per second.
3. Maximum pipe size:
 - a. Provide so as to maintain the minimum 2 feet per second velocity and minimize pump head.

C. AIR RELEASE VALVES

1. Provide at all high points in the force main.
2. Design force main to minimize the number of air release valves.

D. PLUG VALVES

1. For force mains greater than 5,000 feet in length, provide a plug valve at the half way point, every 4,000 feet, 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 force main being tied on.
3. 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. Coat manholes per Section 7.
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.

F. SEPARATION OF PRESSURE SEWER AND WATER MAINS

1. Locate pressure sewer 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 pressure sewer 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 pressure sewer shall be at least 18" below invert elevation of water line.
3. Where pressure sewers cross over or under water lines, maintain 18" minimum vertical clearance between outside edges of the two pipes.
 - a. Use full length of pressure sewer pipe located so that the joints will be equal distance from the water main.

G. COVER

1. Provide suitable cover on all pressure sewers. Minimal cover depth as follows:
 - a. 4" and larger: 36".
2. All piping 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. 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. Where sewer mains 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 storm drainage pipe with less than 18" of clearance.
 - d. Cover is less than the depth prescribed in Part G above.
 - e. Provide polyethylene encasement of all DI Pipe pipe and DI fittings. Minimum nominal thickness of 8 mils conform to AWWA C105..

SECTION 9

PRESSURE SEWER (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.

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, Permit Permax 9430 Type II 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, be green on top, and be 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 be designed to last as long as the pipe it is installed over, even in adverse soils.

- i. All DIP force main shall also include the installation of metallic tracer wire laid 6" above the pipe.
- j. Provide polyethylene encasement of all Ductile Iron Pipe and Ductile Iron fittings. Minimum nominal thickness 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, CIOD.
- c. 14" and larger:
 - 1) Comply with ANSI/AWWA C905 Table 2, pressure class 165, CIOD.
- 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, be green on top, and be 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 be designed to last as long as the pipe it is installed over, even in adverse soils.
 - k. All PVC force main installations shall also include the installation of metallic tracer wire laid 6" above the pipe or attached to the pipe.
3. Polyethylene (PE) Pipe:
- a. Polyethylene (PE) pipe shall be used only for directional drilling under creeks or marsh crossings. All other uses of Polyethylene (PE) pipe shall be approved by the District.
 - b. Comply with AWWA C-906, SDR 11 and working pressure of 160 psi minimum.
 - c. The pipe supplied shall be SDR high performance, high molecular weight, high density polyethylene pipe, and shall conform to ASTM D 1248 (Type III C, Category 5, P34). Minimum cell classifications values shall be 345434C as referenced in ASTM D-3350 - latest edition. 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. The fittings supplied in this specification 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. Physical properties:
 - 1) The pipe shall conform to the physical properties as described herein.
 - 2). Typical pipe physical properties:

<u>Property</u>	<u>Test Method</u>	<u>Unit</u>	<u>Value</u>
Density	ASTM Method	gms/cc	0.955
Melt Index	ASTM D-1238 (190/2.16)	gms/10 min	

Environmental Stress Cracking Resistance:

Condition A, B, & C, F-0	ASTM D-1693	hrs	>5000**
Compressed Ring, F-60	ASTM F-1248	hrs	>1500
Tensile Strength, Yield Type IV Specimen	ASTM D-638 (2"/min)	psi	3200
Elongation at Break Type IV Specimen	ASTM D-638 (2"/min)	%	>750
Vicat Softening Temp	ASTM D-1525	°F	257
Brittleness Temp	ASTM D-746	°F	<-180
Flexural Modulus	ASTM D-790	psi	135,000
Modulus of Elasticity	ASTM D-638	psi	130,000
Hardness	ASTM D-2240	Shore D	65
Linear Thermal Expansion Coef.	ASTM D-696	in./in./8F	1.2x10-4
Thermal Conductivity	Dynatech-Colora BTU, In./Thermoconductor ft./2hrs/8F		2.7

Long Term Strength:

738F	ASTM D-2837	psi	1600
UV Stabilizer	ASTM D-1603	%C	2.5
Material Cell Classification	ASTM D-1248		345434C
Material Description	PPI Recommendation		PE 3408

e. Quality control:

- 1) The resin used for manufacture of the pipe shall be manufactured by the pipe manufacturer, thus maintaining complete control of the pipe quality. The pipe shall contain no recycled compound except that generated in the manufacturer's own plant from resin of the same specification from the same raw material. The pipe shall be homogenous throughout and 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 have all ingredients pre-compound prior to extrusion of pipe, in plant blending is not

acceptable. Owner 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.

- f. All polyethylene (PE) pipe shall include the installation of metallic tracer wire attached to the pipe.
- g. Rejection:
 - 1) The District reserves the right to reject any polyethylene pipe and fittings failing to meet any of the requirements of this specification.
- h. Joints: All electrofusion joints to MJ DIP fittings shall be furnished 316SS with 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 to a minimum distance of 18' on each side of the fitting or valve for 12" piping and smaller and to a minimum distance of 36' 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 can be used on a case-by-case basis as directed by the District where high pipe forces and marginal soil conditions dictate their use.
5. Restrained joint pipe will be indicated clearly on plans. 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 AND VACUUM VALVES

1. Single body universal type with compound lever system.
2. Internal linkage and float of stainless steel.
3. Capacity: At 10 lbs. working pressure, vent not less than 25 cfm of free air.
4. Provide the following:
 - a. 2" inlet.
 - b. 2" stainless steel T-handle ball valve.
 - c. 1" blowoff stainless steel T-handle ball valve.
 - d. Quick disconnect couplings.
 - e. Back flushing hose.
 - f. "Protectop" cover.
 - g. Piping, nipples, plugs, etc.: Schedule 40, type 316 stainless steel.
5. Use short body valves where height restricts the use of long body valves.
6. Acceptable product: Multiplex Manufacturing Co., Crispin Model UX20 Sewage Valve, G.A. Figure 942-F or ARI Model D-020, D-023, D-025, or approved equal, and the automatic air release valves ARI model S-020 or approved equal.
7. Valve manhole:
 - a. Use manhole wall sections.
 - b. Provide manhole frame and vented cover.

E. CASING, SPACERS AND END SEALS FOR UTILITIES

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 to be a minimum of 2" larger than the largest outside diameter of the carrier pipe (joints and couplings) if the carrier pipe is less than 6" in diameter. If 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 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	¼
16 and 18	5/16
20 and 22	3/8
24 and 26	7/16
28 thru 32	½
34 thru 42	9/16
44 thru 48	5/8
50 thru 54	¾

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 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 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 T-304 stainless steel bands.
 - c. Acceptable manufacturers: Cascade Manufacturing, Pipeline Seal and Insulator, Inc. or approved equal.

SECTION 10

PRESSURE SEWER (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 pipe 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 pressure sewer 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 pressure sewer 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 pressure sewer shall be at least 18" below invert elevation of water line.
3. Where pressure sewers cross over or under water lines, maintain 18" minimum clearance between outside edges of the two pipes.
 - a. Use full length of pressure sewer 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. Take up 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 pipe where any part of lining is damaged.
 - i. Lay pipe to the grades indicated on the plans. Avoid excessive high points in the force main.
 - 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:
- a. Mechanical and push on joints, install in accordance with ANSI/AWWA C600.
 - b. Gaskets: Handle, lubricate where necessary and install in strict accordance with manufacturer's recommendations.
3. Plastic 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.

G. INSPECTIONS AND TESTING

1. General:
 - a. The District will require that all sanitary sewer systems 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 100 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 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 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. For pressure systems, the 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

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 recommended by the manufacturer. 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, 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 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.
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. 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. 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. Comply with OSHA guidelines.

J. 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 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.

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 road base and asphalt shall be in accordance with South Carolina Department of Transportation (SCDOT) regulations.
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.

SECTION 11

SANITARY SEWER PUMP STATION

DESIGN STANDARDS

A. GENERAL

1. The following sanitary sewer pump station design guidelines are based on Federal, State and local health requirements and the District's 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.
3. Design criteria for other than normal circumstances are to be presented to the District for approval prior to preparation of plans and specifications.
4. The Engineer should submit the following design calculations:
 - a. Station service area 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.

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 6" minimum above 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 point at or near peak efficiency unless otherwise approved by the District.
 8. Pumps shall be non-overloading for all duty points.
 9. Provide by-pass connection per detail.
 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.
 12. Minimum pump efficiency shall be 60% at the design duty point unless approved otherwise by the District.

C. SUBMERSIBLE PUMP STATION

1. Opposite opening, single or dual watertight access covers with safety grate system.
2. Provide components of the pump station per detail section.

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 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. Wire to water efficiency curves shall be submitted for approval.
- e. Three (3) phase power shall be required on all 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 lift 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 6'. Chain shall be ¼" welded hot-dipped 316 stainless steel link chain.

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 and H-O-A switch.
- 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 ten (10) HP and larger shall be equipped with "soft start" motor controllers.

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 ½" tap with pressure gauge connection after the true wye.
- 4. Provide air release valve as shown in the detail section.
- 5. 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 Guide Rail System.

- 5) Rail guides
 - 6) Cable holder
4. Level controls shall be floats.
 5. Locate floats where flow from the inlet pipe will not interfere with normal operation of the floats at all operating levels.
 6. Provide a stainless steel hanger for the float cables.
 7. Line interior of wetwell with 240 mills of NEOPOXY NPR 5300.
 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 4" DIP with 180" vent cap with 316SS screen for venting the wetwell extended 1'– 3" above the 100-year flood elevation.
 12. The bottom slab of the wetwell shall be set on a minimum of twenty four (24) inches 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.
 15. All hatches shall be watertight 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.
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. For all pump stations with 30Hp and smaller pumps provide a double throw Manual Transfer Switch (MTS) sized to accommodate the calculated loads. Transfer switch shall be stainless steel NEMA 4X, located a minimum of 1'-3" above the 100 year flood elevation, gasketed with drip shield. Provide a receptacle with reversed contacts for the Owner'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.
7. All electrical cables from the motors and float switches shall be terminated in a NEMA 3/7 explosion-proof junction box located adjacent to or directly below the pump control panel. The junction box shall contain power distribution blocks (Square D Type LB or equal) for the termination of the power cables and terminal blocks (Square D Type G or equal) for the termination of the float cables and sensor cables. The conduits entering the box from the wetwell shall be sealed with duct seal and provide with 316SS cable strain relief support.
8. The conduits from the junction box to the pump control panel shall be sealed with Condulet type seals or Type ES sealing hubs. All seals shall be made with Chico brand sealing compound poured to a thickness of no less than the trade size of the sealing fitting end, in no case less than 5/8".
9. All electrical equipment shall be located outside of the hazardous areas, but the conduit seals shall be located within 10' of the classification boundary.

10. All conduit shall be Schedule 80 PVC.
11. Provide support for electrical equipment in accordance with details.
12. Provide 70-watt high pressure sodium floodlight with photo cell and weatherproof switch at each site. Mount on top of control panel support structure to light wetwell and valve vault area.
13. Wetwell float switch hangers shall be located at the edge of the hatch.
14. Provide concrete pad for pump control panel only, when supported on legs to extend out 3' from the face control panel.
15. All electrical equipment shall be located 1' 3" above the 100-year flood elevation. All electrical equipment located below 1'-3" above the 100-year flood level shall be NEMA 6X.
16. 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: 50' x 50'.
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
4. Area within pump station site:
 - a. 6" SCDON No. 789 granite aggregate with applicable soil poisoning..
5. Fencing of Lift Station Site
 - a. All pump stations shall have 6'-0" high commercial grade chain link black vinyl coating fencing as indicated on the District Standard Fence Detail. Alternative materials and fence design shall be considered on a case by case basis, provided the Developer or HOA/POA pays all additional costs required for structured fencing.

6. Minimum twelve (12) feet wide opening, two (2) section gate to allow entrance of service trucks and vacuum truck without blocking the main roadway.
7. Design site layout to allow access of service trucks and vacuum truck to the wetwell.
8. Power pole should be located within 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 power lines within the site shall be underground. No overhead power line will 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.

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 pump station details.
3. Wetwell vent:
 - a. Double Cast Iron FE 90° Bends vent cap..
 - b. Ductile iron connection piping, sized for adequate wetwell air volume exchange per pump cycle. (minimum 4" DIP) .
 - c. Finish:
 - 1) Primer - one (1) coat of Tnemec Polyuraprime.
 - 2) Paint - two (2) coats of Tnemec Epoxy Polyurethane Series 66 or 69 high build epoxoline at 5 mils thickness.
4. Cable holders:
 - a. Use six (6) hook, 316L stainless steel
 - b. Acceptable manufacturer: Halliday Metals.
5. Interior coating:
 - a. Provide 240 mills of NPR 5300 NeoPoxy or approved equal by the District.
6. Other pump station appurtenances.
 - a. Comply with pump station details.

B. SUBMERSIBLE PUMP STATION

1. Acceptable pump manufacturer: Flygt and ABS..
2. Provide a service engineer 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 of each seal assemblies.
 - 2) One complete set of bearings.
 - 3) One set of wear rings.
 - 4) One of each type relay.
 - 5) One pump starter.
 - 6) One pump alternator.
 - 7) One float switch with cable.
 - 8) One of each type pilot light.
 - 9) One box of each type lamp.
 - b. Two (2) complete sets of record drawings for wetwell, electrical, electronic schematics (and six (6) copies 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.
 - 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) Double shrouded non-clog type.
 - 2) Gray cast iron, Class 30, balanced dynamically to 0.5".
 - 3) Paint with one coat of alkyd resin primer.
 - 4) Provide wear ring consisting of a replaceable stationary ring made of brass, drive fitted to the volute inlet.
 - 5) Sliding fit between the impeller and the shaft with one key.
 - c. Volute:
 - 1) Single piece, non-concentric design.

- 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) B-10 bearing life of 50,000 hours.
 - 3) Upper bearing: single deep groove ball bearing or approved equal.
 - 4) Lower bearing: two row angular contact ball bearing or approved equal.
- 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.
 - 2) Operate the upper of the tandem set of seals in an oil chamber.
 - 3) Upper seal set: one stationary 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.

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 F insulation system, Class F materials rated for continuous duty in 408C (1048F) liquids.
 - 4) Cast iron motor frame and end shields.
 - 5) Stainless steel hardware and shaft.
 - 6) Service factor: 1.15.
 - 7) Stator:
 - a) Heat-shrink fitted to shaft.
 - b) Dip and bake in Class F 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.
 - 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. Discharge connection:
- 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 either be machined or gasketed subject to District approval.
 - d. Stainless steel sliding guide bracket to be an integral part of the pump unit.
 - e. Guide the entire weight of the pumping unit by a single or 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:
- a. Gray cast iron: ASTM A48, Class 30.
 - 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 (per pump):
 - a. Guide rails shall be Schedule 40, Type 316 stainless steel pipe, with diameter as specified by manufacturer.
 - b. 316 stainless steel bottom and top pilots.
 - 1) Acceptable manufacturer: Halliday Metals.
10. Pump guides:
 - a. Attach to pump volute with stainless steel hex head cap screws.
11. Lift chain:
 - a. Provide each pump and motor with adequately sized Type 316 stainless steel lifting chain.
 - 1) Minimum ¼" welded stainless steel link chain.
 - b. Length to reach top of station plus an additional 12'.
 - 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, machine screws, nuts, washers, and lockwashers for complete assembly of wetwell access cover, guide rails, and discharge elbow to be Type 316 stainless steel.
13. Wetwell access:
 - a. Fabricate from welded aluminum sections.
 - b. Provide single or dual hinged door of ¼" aluminum treadplate for each pump.
 - c. Flush upper surface.
 - d. Fit door with recessed latch.
 - e. Provide safety grate system.
 - f. All hardware: Stainless steel.g.pe 316 stainless steel support bracing with a self-locking hinge mechanism.
14. Pump control panel:

- a. Enclosure:
 - 1) Code gauge 316L stainless steel: NEMA 4X, gasketed with drip shield.
 - 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 magnetic motor starters.
 - a) Acceptable products: Square D (Class 8606).
 - b) Use motor starter contacts easily replaceable without removing the motor's starter from its mounted position.
 - c) Provide phase failure, undervoltage release and overload protection on all three phases.
 - i) Acceptable product: Allen Bradley 813S or Diversified SLA-230-ASA.

- d) For motors less than ten (10) HP in size, provide open frame, across the line, type.
 - (e) Variable Frequency Drives (VFD's) shall be required for pump motors greater than 30 HP or as directed by the District.
 - (f) Pump motors 10 HP and larger in size shall be provide with open frame, reduced voltage, closed transition "soft starts" as approved by the District.
- 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) Provide Square D.
- c. Components:
- 1) Provide "H-O-A" switches for each motor.
- a) UL rated, heavy duty, 600 VAC, NEMA 4X, oil-tight switches.
 - b) Acceptable products: Allen Bradley 800H or Square D Class 9001 SK.
 - c) "Hand" position not to override motor overload shutdown.
- 2) Provide the following components with the panel:
- a) Pilot run light for each motor.
 - b) Lockable enclosure with 3 point hitch.
 - c) Condensation heater.
 - d) High level alarm indication light.
 - e) Alarm bell silence.
 - f) GFI 20A duplex receptacle with stainless steel cover.
 - g) Weatherproof switch for flood lights.

- h) Control relays.
 - i) Remote alarm terminals.
 - j) “Seal failure” indicator lamp.
 - k) “High temperature” indicator lamp.
 - l) “Power on” indicating lamp.
 - m) Temperature failure test push-button.
 - n) Seal failure test push-button.
 - o) Temperature and seal failure resets.
- d. Pump alternator relay:
- 1) Provide electrical design.
 - a) Acceptable product: Model DUP-120-023P.
 - 2) Provide pump sequence selector switch.
 - a) Provide manual selection of either Pump No. 1 or No. 2 as the “LEAD” pump.
 - b) Acceptable products: Allen Bradley Series 800H or Square D Class 9001SK.
- e. High temperature shutdown:
- 1) Provide high temperature shutdown for each motor utilizing the temperature switches embedded in the motor windings.
 - a) Under high temperature conditions the switch shall open, de-energize the motor starter and stop the pump motor.
 - b) Automatic reset type.
- f. Moisture detector control (seal failure):
- 1) Provide for each pump a float switch sensor to detect moisture in the stator chamber.
 - 2) Detection of moisture by the sensor shall disrupt the motor starting circuit of the pump.
 - 3) Motor shall remain inoperative until problem is corrected and the control circuit is manually reset.

- g. Provide overload reset device:
 - 1) Operable without opening the inner swing panel.
- h. 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) Duplex receptacle.
 - c) Condensation heater.
 - d) Flood light (100 watts).
 - e) Remote telemetry unit (1200 watts minimum).
 - f) Gas alarm panel (300 watts).
 - g) High Level alarm light and bell.
 - 2) Lightning arrestor.
 - a) Acceptable product: Delta Type "LA".
 - 3) Provide power terminals and control terminals.
- i. Design control sequence so that panel is functioning automatically again after a power failure and manual reset is not necessary.
 - 1) Provide a time delay relay to prevent both pumps from starting simultaneously after power failure.
- j. Provide a terminal board for connection of line, pump leads, level sensors and remote power and alarms.
- k. Provide elapsed time meter wired to each motor starter at the bottom of the heater block.
 - 1) Six digit, non-resettable.
 - 2) Indicate total run time in hours and tenths.
- l. Provide high water alarm activated by float switch.
 - 1) Front panel mounted silence switch.
 - 2) 120V AC.

- 3) Utilize standard 40 watt incandescent bulb, 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.
- m. Provide a motor ammeter:
 - 1) Panel mounted.
 - a) Scale range greater than pump rating.
 - b) Provide an "Off-L1-L2-L3" selector switch.
 - c) Provide a "Pump 1 - Pump 2" selector switch.
 - d) Acceptable manufacturer: General Electric.
- n. 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
- o. 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.
- p. Attachment screws.
- 1) 316 stainless steel.
- q. 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.
 - 4) Provide sufficient motor lead wiring and float control wiring to make connections in the junction box.
- r. Level control and motor power cable:
- 1) Provide cable of adequate length to terminate in control panel junction box without splicing unless directed otherwise by the District.
- s. Acceptable manufacturer:
- 1) Control panel: Sta Con, or as approved by the District.
 - 2) Switches, push-buttons and indicator lamps:
 - a) Allen Bradley Series 800H or Square D Class 9001 SK.
- t. Remote alarm contacts and terminals to RTU:
- 1) Provide contacts for the following:
 - a) Generator on.

- b) Generator off.
- c) Low level.
- d) Power off.
- e) High level.
- f) Pump on (all pumps).

15. Pressure gauges connections:

- a. Provide on the discharge side of the gate valves.
- b. ½" Type 316 stainless steel shutoff valve with Viton seals.
 - 1) Acceptable product: Whitey ball valve.
- c. ½" stainless steel piping connections.

16. Gas detection system.

- a. Provide combustible gas sensor module suitable for installation in wetwell. (SMC Model 201 from J.H. Instruments, Charlotte, NC (704)527-6920).
- b. Provide dual channel gas alarm panel for local alarm. (SMC Model 2102 from J.C. Instruments, Charlotte, NC (704)527-6920).

C. LEVEL CONTROL SYSTEM

- 1. Use six (6) float switches.
- 2. Floats
 - a. Single action 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.
- 3. Provide for duplex operation:

- a. Utilize "LEAD/LAG" principal using six (6) 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 "low" level. (SCADA Alarm)
 - 6) 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 40' of cable.
 - c. Polypropylene cord grips and mounting hardware.
5. Cable holder:
- a. 316L stainless steel, six hook design.
 - b. Mount with 316 stainless steel anchors.
 - c. Acceptable manufacturer: Halliday Metals.

D. BALL CHECK VALVES

1. Furnish cast iron bodied valves.
2. Valve ends to be flanged, ANSI 125 lb. standard.
3. Provide hollow steel ball:
 - a. Specific gravity greater than 1.0.
 - b. Provide vulcanized nitrile rubber covering.
4. Provide flanged cap with gasket and stainless steel bolts.
5. Provide rubber seat.

6. Pressure rating – 150 psi.
7. Maximum working temperature – 185°F.
8. Valve to be suitable for buried service.
9. Acceptable manufactured: Flygt Type 5087 or approved equal.

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 screwed, flanged or mechanical joint end connections as indicated on the Drawings.
 - c. Provide valves of bolted bonnet design:
 - 1) Valves 4" and larger to be designed to allow repacking without removing the bonnet or actuator and the packing shall be adjustable.
 - 2) Packing to be replaceable with the valve under pressure with valve open or closed with pressure on either side of the plug.
 - d. 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.
 - e. Valve bodies shall be cast iron complying with ASTM A 126, Class B and AWWA Standard C-504-80, Section 5.4.
 - f. All exposed nuts, bolts, springs, etc. shall be 316L stainless steel on all valves.
2. Port areas:
 - a. Four inch through twenty inch valves, not less than 80% of full pipe area.
 - b. Twenty-four inch and larger, not less than 70% of full pipe area.
 1. Port to be smoothly shaped with an unobstructed waterway when open.
3. Seats:
 - a. Provide corrosion resistant seats complying with AWWA Standard C507-73 and AWWA Standard C504.
 - b. Three inch and larger valves to have a 1/8" thick hand welded-in overlay of not less than 90% nickel content on all surfaces contacting the plug face.
 1. Seat to be raised 1/8" from the valve body and machined to a smooth finish.
 - c. Screwed in or bolted in seats are not acceptable.
4. Bearings:

- a. Provide valves through twenty-inch size with permanently lubricated, Type 316 stainless steel bearings in the upper and lower plug stem journals.
 - b. Provide 24" and larger valves with bronze bearings and stainless steel sleeves in the upper and lower plug stem journals.
 - c. Bearings to comply with AWWA Standard C507-73 and AWWA Standard C504.
 - d. Lower bearing housing to be raised from the body to reduce the possibility of grit and sand entering the bearing housing.
5. Flanged end connections:
- a. Provide, where indicated, valves with flanged ends, faced and drilled to ANSI 125/150 lb. standard.
 - b. Flanged valves through 12" to have face-to-face dimensions of AWWA standard gate valves.
6. Resilient plug facing:
- a. Provide neoprene plug facings vulcanized to the plug and suitable for use with domestic wastewater.
 - b. Plug to be one piece with integral stem through the actuator.
 - c. Do not use plugs with cast inlays.
7. Buried service valves:
- a. Provide seals on all shafts and gaskets on valve covers to prevent entry of water and dirt.
8. Pressure gauge taps:
- a. Provide 1/4" tap with plug on end of the valve for pressure gauge connections.
9. 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 4" and larger valves with gear actuators.
 - 1) Provide gear to fit on hexagonal valve shaft to allow operation without the use of roll pins.
 - a) Adaptor between plug shaft and actuator shaft is not acceptable.
 - 2) Handwheel components between the input and the stop-limiting devices to be designed to withstand, without damage, a pull of 200 lbs. as required by the American Water Works Association (AWWA) Standard C504-74 Section 11.2.3.
 - 3) Provide spring loaded U-cup seals on gear sector of gearbox housing.
 - a) Do not provide O-ring seals.
 - 4) Gear actuators, normal service:
 - a) Enclose all gearing in semi-steel housing suitable for running in a lubricant with seals provided on all shafts to prevent entry of dirt or water into the actuator.
 - b) Support actuator shaft and quadrant on permanently lubricated bronze bearings.
 - c) Provide valve position indicator and an adjustable stop to set closing torque.
 - d) All exposed nuts, bolts and washers to be stainless steel.
 - e) Provide air gap between the actuator and the valve body to prevent leakage from the valve into the actuator.
 - 5) Gear actuators, buried service:
 - a) Provide neoprene seals on all shafts and gaskets on actuator covers to prevent entry of water and dirt.
 - b) Mounting brackets to be totally enclosed with gasket seals.
 - c) Support actuator shaft and quadrant on permanently lubricated bronze bearings.
 - d) All exposed nuts, bolts and washers to be stainless steel.

10. Acceptable product: DeZurik.

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 ¾" 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/or ultrasonic level transmitter hanger to precast top:
 - a. Use Type 316 stainless steel anchors.
5. Install pumps and piping, plumbing assembly for proper alignment and fit.
6. Seal around inlet and discharge piping with non-shrink grout.
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 NEC and local 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 pertinent National Electric Code requirements.
 - d. Seal conduit terminations in control panel with duct seal.
 - e. Use licensed personnel.
3. 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 6' underwater. Contractor shall furnish all required potable water.
 - 5) After operational test No. 4, perform the insulation test (No. 2) again.
 - 6) Supply a written report stating the foregoing steps have been done with each pump at the time of shipment.
 - b. Provide the following tests after installation:
 - 1) In presence of the Developer's Engineer and the District:

- a) Remove pump from structure.
 - b) Replace, demonstrating proper alignment and operation of mating parts.
- 2) Operate pumps utilizing manual and automatic modes.
 - 3) Demonstrate proper operational sequences, including alarm conditions.
 - 4) Measure amperage, voltage, pumping rate and discharge pressure for:
 - a) Each pump operating separately.
 - b) Both pumps operating simultaneously.
 - 5) The design engineer shall conduct testing of pump station pumps and controls to verify operating parameters are met per design criteria. The design engineer shall be responsible for coordinating the pump manufacturers, the District representative, and the contractor for draw down testing.
 - 6) The design engineer shall submit six (6) copies of final test report to the District.

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.

SECTION 14

JIPSD ALTERNATIVE WASTEWATER COLLECTION SYSTEMS (AWCS) SPECIFICATIONS

Whenever possible, wastewater collection system extensions shall be constructed as conventional gravity 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

The Developer must submit a feasibility report for JIPSD review and approval, which outlines the need to use an alternative wastewater collection system. 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 in any proposed subdivision to be served by AWCS grinder pumps shall be four (4) lots or 40% (rounded down to the nearest whole number) of all 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.
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 service.

4. Each approved subdivision containing AWCS lots shall be required to incorporate Property Owner Association (POA) covenants and restrictions stating that the POA is fully responsible for ownership, operation, and maintenance. Lots requiring AWCS service shall be specifically identified in the subdivision covenants and restrictions. A draft copy of proposed covenants and restrictions applicable to the ownership and permitted operation of AWCS facilities shall be submitted to the District for review and approval. A final, fully executed and recorded copy of the POA covenants and restrictions 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 grinder pumps shall be located and installed 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 new AWCS customer. The District shall be the applicant for all AWCS forcemain encroachment permits to be located within public rights-of-way. Multiple AWCS lots in a single subdivision shall be permitted under a consolidated SCDHEC Construction Permit.
3. A SCDHEC Operating Permit covering each separate AWCS service must be received prior to JIPSD accepting new AWCS facilities for operation and maintenance.
4. All JIPSD fees shall be paid prior to construction

C. Existing Lots

If a lot exists within the JIPSD service area the owner may install one (1) AWCS grinder pump to serve the property if 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.

D. AWCS Hold Harmless Agreements

Each AWCS customer shall execute a standard District “Hold Harmless Agreement” wherein the AWCS customer shall be solely responsible for AWCS service interruption due to mechanical failure of any AWCS component located on private property, power outages, or other AWCS service interruptions beyond the control of the JIPSD.

Section 15

Sand, Oil and Grease Interceptors

I PREFACE

Chapter 2 Section 2.8.2 of the current James Island Public Service District's (JIPSD) Use and Rate Resolution states, "Grease Traps shall be installed by all Customers: i) having food service operations or ii) operations which have the capability to produce Sewage 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 Garbage that does not satisfy the definition of Properly Shredded Garbage. 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 with no interceptor 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 through 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 it ultimately responsible for the proper maintenance of the grease trap facility(s).

8. No new food service establishment will be allowed to initiate operations until 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 should not be discharged to grease traps/inceptors unless 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 practical new food service establishments located in existing buildings will 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 physically impossible 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 building official that certificates of occupancy be withheld until compliance with JIPSD's requirements including grease trap compliance is fully met.

SECTION 16

CONTRACTOR SAFETY

This document informs interested persons, including employees, that our facility has developed a procedure to transmit safety information both from the District to contractors and their workers and from contractors and their workers to the District. Common sense and safety concerns encourage standardization of these communications. These procedures standardize information transfer to make sure that all concerned have the information they need to work safely.

I. Purpose

A written Contractor Safety policy establishes guidelines to be followed for contractors working at the District. The rules established:

- Provide a safe working environment.
- Govern facility relationships with outside contractors.
- Ensure that contractor employees and our employees are trained to protect themselves from all potential and existing hazards.

The effectiveness of the Contractor Safety program depends upon the active support and involvement of all employees. This plan is intended to implement a program to ensure that all contractor work practices are carried out safely to minimize the possibility of injury or harm to the contractors' employees or our own employees. It is intended to serve as an additional tool in safeguarding the health and safety of employees.

The Contractor Safety policy establishes uniform requirements designed to ensure that contractor safety orientation, coordination, and safety administration practices are communicated to and understood by employees.

This document is provided to ensure all District safety plans, policies and procedures are communicated to all participating contractors. It also provides an avenue for contractors to communicate their safety plans, policies and procedures to the District. This program aims to prevent personal injuries and illnesses.

II. Administrative Duties

The Safety Director is responsible for developing and maintaining the program. In addition, the Safety Director and the respective Department Head are responsible for maintaining any records related to the Contractor Safety program.

III. Explanation Of Responsibilities

1. District Responsibilities

The District has specific safety responsibilities when hiring contractors to come onto the worksite, onto the grounds, or into the buildings or facilities to perform work. District responsibilities when hiring contractors include the following listed steps. The District will:

1. Take steps to protect contract workers who perform work on or near a potentially hazardous process.
2. Obtain and evaluate information regarding the contract employer's safety performance and programs.
3. Inform the contractor of known potential fire, explosion, or toxic release hazards related to the contractor's work and the process.
4. Explain the applicable provisions of the emergency action plan to the contractor, and require that the contractor disperse that information to all workers who will work at this site.
5. Develop and implement safe work practice procedures to control contract employee entry into hazardous work areas.
6. Maintain a contractor employee injury and illness log.
7. Periodically evaluate the contract employer's fulfillment of his or her responsibilities under this policy.

2. Contractor Responsibilities

Contract employees must perform their work safely. Considering that contractors often perform very specialized and potentially hazardous tasks, such as confined space entry activities and non-routine repair activities, their work must be controlled. Contractor responsibilities when accepting contracts with the District include the following listed steps. The contract employer shall:

1. Assure that the contract employee is trained in the work practices necessary to safely perform his or her job.
2. Instruct the contract employee in the potential fire, explosion, or toxic release hazards related to his or her job and the process.
3. Assure that the contract employee knows the applicable provisions of the emergency action plan.
4. Document contract employee training.
5. Inform contract employees of and then enforce safety rules of the facility, particularly those implemented to control the hazards of the contracted process during operations.
6. Require that all subcontractors abide by the same rules to which the contractor is bound by this section.
7. Abide by the facility smoking rules. Smoking is prohibited within all buildings and in certain areas surrounding some facilities.
8. Therefore, permission must be requested before the contractor's employees are allowed to smoke in any area.

IV. Guidelines For Contractor Safety

The following listed steps are the standard procedures for evaluating and choosing contractors who

will work on-site at this company.

Obtain and evaluate information regarding a contractor employer's safety performance and programs when selecting a contractor to perform any type of contract work that might bring them into contact with any hazardous chemical or process on the premises of the District.

To determine that past safety performance, the group or individual selecting the contractor should consider the contractor's:

- Employee injury records such as Experience Modification Rate (EMOD) for Workers' C Compensation for the past three years and the contractor's past safety record in performing jobs of a similar nature.
- OSHA 300A, which includes the injury and illness rates (number of lost-time accident cases, number of recordable cases, number of restricted workday cases, number of fatalities) for the past three years.
- Incidence rates for lost-time accidents and recordables for the past three years.
- Written safety program and training system.

For contractors whose safety performance on the job is not known, obtain information on injury and illness rates and experience and obtain contractor references.

Contractor work methods and experience should be evaluated. Ensure that for the job in question the contractor and its employees have the appropriate:

- Job skills.
- Equipment.
- Knowledge, experience, and expertise.
- Any permits, licenses, certifications, or skilled trades people necessary to be capable of performing the work in question.

The contractor must be willing and able to provide a current certificate of insurance for Workers' Compensation and general liability coverage with the contracting company.

Each contractor must be responsible for ensuring that its employees comply with all applicable local, state, and federal safety requirements, as well as with any safety rules and regulations set forth by the District, at which it is performing the contracted work.

Possible ways to determine past compliance with such safety regulations include:

- Requesting copies of any citations for violations occurring within the last three years, to determine the frequency and type of safety laws violated.
- Having all bidders on jobs describe in detail in writing any safety programs in place at the contractor, infractions, accidents, and Workers' Compensation claims within the last three years. This information will provide James Island Public Service District with a solid background on that contractor's safety performance and adherence to safety rules and regulations.

V. Guidelines For Information Exchange

Before contract work begins, the District shall:

1. Designate a representative to coordinate and communicate all safety and health issues with the

contractor. The designated representative will have a copy of the work document, be thoroughly familiar with its contents, and with the safety and health aspects of the work, or know who to call to obtain this information. The designated representative is responsible for ensuring that all districts responsibilities listed below are carried out.

2. Provide a copy of the facility's written safety policies and procedures to the contractor.
3. Inform the contractor of any emergency signals and procedures that may be put into operation in areas where the contractor's employees are working. The contractor should be given the telephone numbers of the nearest hospital, ambulance service, and fire department.
4. Conduct an inspection of the proposed worksite area before the prestart-up meeting so any known information about on-site hazards, particularly non-obvious hazards, are documented and thoroughly communicated to the contractor.
5. Work directly with the contractor's designated representative, with whom all contacts should be made.
6. Conduct a pre-job briefing (walk-through) with the contractor's designated representative and a supervisor from each of the areas of the District involved in the contractor's work.
7. Review all contract requirements related to safety and health with the contractor's designated representative, including, but not limited to, rules and procedures, personal protective equipment (PPE), and special work permits or specialized work procedures. Advise the contractor that the facility safety and health policies must be followed. A copy of the facility's safety plans must be furnished to the contractor.
8. Inform contractor's designated representative of the required response to employee alarms and furnish the contractor with a demonstration or explanation of the alarms.
9. Communicate thoroughly with the contractor's designated representative any safety and health hazards (particularly non-obvious hazards and hazard communication issues) known to be associated with the work, including those in areas adjacent to the worksite. Tell them it is the contractor's responsibility to convey this information to its employees.
10. Review preparation of worksite before contractor begins initial work.
11. Identify connect-points for all services, such as steam, gas, water, electricity, etc. Define any limitations of use of such services.
12. Ensure that all affected employees at the district receive training on all hazards to which they will be introduced by a contractor.

During the contract work, the District shall:

1. Limit, as necessary, the entry of District employees into contractor work areas.
2. Monitor the contractor's compliance with the contract throughout the duration of the work. When checking contractor work during the project, note any negligent or unlawful act or condition in violation of safety standards or requirements. Any items noted should be brought immediately to the attention of the contractor's designated representative in writing, with a copy of the notice being sent to the contractor's home office concurrently. However, if an unsafe act or a condition is noted that creates an imminent danger of serious injury, immediate steps should be taken with the contractor's designated representative, or in his or her absence, the contractor's employees to stop

the unsafe act or condition. Do not allow work that is in violation of a regulation to continue.

3. Document all discussions, including place, time, and names of contractor employees in attendance.
4. Approve the contractor beginning work each day, unless it is routine service or maintenance work or periodic outdoor service or maintenance work.
5. For work for which the District has developed specific and generally applicable procedures, make sure contractors and their subcontractors follow the same procedures.
6. Do not allow loaning of tools and equipment to outside contractors and their subcontractors. The contractor is required to provide the necessary tools and equipment.
7. Contact the nearest medical facilities, when available, in emergency situations where severity of the injury dictates immediate attention.
8. Obtain a copy of each OSHA recordable injury report from the contractor and subcontractor. Investigate and report to the Safety Director and District Manager all personal injuries to contractor and subcontractor employees.
9. Investigate and report any property losses. Maintain a contractor accident report file. After conclusion of the contract work, the Department Head and the Safety Director completes a post-project assessment of the contractor's safety performance for the District Manager to be used for future reference, with a recommendation on whether or not to re-hire the contractor.

1. Contractor Guidelines for Information Exchange

Before the contract work begins, the contractor must:

1. Designate a representative to coordinate all safety and health issues and communicate with the District's designated representative.
2. Provide documentation of any necessary safety training, as described in the Training Requirements section of this policy, to the Districts designated representative.
3. Sign a confidentiality statement to protect the District's proprietary data.
4. Provide information to the designated representative on the safety and health hazards that may arise during the course of the contractor's work at the District and the means necessary to avoid danger from those hazards, including Hazard Communication and all other potential hazards.
5. Obtain from the District any safety rules and regulations in effect at the District or potential hazards present that may affect the contractor's work.
6. Be certain to be informed of any emergency signals and procedures that may be put into operation in areas where the contractor's employees are working. The contractor should be certain to have the telephone numbers of the nearest hospital, ambulance service, and fire department.
7. Advise and train its employees on hazards associated with the work to be performed, including any Hazard Communication or other hazard information provided the contractor by the Districts designated representative.
8. Keep the designated representative of the District fully informed of any work which may affect the safety of District employees or property. This includes complying with the state and federal Right-to-

Know legislation and providing the designated representative appropriate material safety data sheets (MSDSs) or other required information about chemicals the contractor will bring onto the site.

9. Know who to call and what to do in emergencies, including where first-aid and medical services are located and train employees on this.

During the contract work, the contractor shall:

1. Have a designated site safety coordinator present and attentive to the work being carried out at all times that the contractors and/or subcontractors are working at the facility site.

2. Ensure that all subcontractors are abiding by the terms of this plan.

3. Establish necessary safe practices to permit work under operating conditions without endangering the District's associates and property. This includes but is not limited to barricading, sign-posting, and fire watches.

4. Make sure that any equipment, chemicals, or procedures used by the contractor to perform contracted work meet all OSHA requirements.

5. Be held responsible and accountable for any losses or damages suffered by the District and/or its employees as a result of contractor negligence.

6. Provide its employees with medical care and first-aid treatment.

7. Use only the building entrance designated and follow the District's access control practice.

8. Provide supervisors and employees who are competent and adequately trained, including training in all health and safety aspects of the work involved in the contract.

9. Provide all tools and equipment for the work, including personal protective equipment (PPE), and ensure the equipment is in proper working order and employees are instructed in its proper use.

10. Maintain good housekeeping in the workplace.

11. Follow specific instructions supplied by the District should emergency alarms be activated.

12. Notify the designated representative immediately of any OSHA recordable injury or illness to contractor employees or subcontractor employees occurring while on the site of the District. Provide a copy of each accident report to the designated representative.

13. Receive and use a copy of the District's written safety policies and procedures.

After conclusion of the contract work, the contractor is responsible for cleaning all work areas and disposing of any discarded materials in a proper and legal manner.

VI. Training Requirements

1. District Requirements

James Island Public Service District makes sure that affected District employees receive training on all hazards to which they will be introduced by a contractor.

In addition, the District emphasizes to contractors that it is the contractor's responsibility to convey to its employees any safety information provided by the District to the contractor.

2. Contractor Requirements

The contractor must:

1. Train all workers on all safety and health hazards and provisions applicable to the type of work being done, and provide documentation of such training to the District's designated representative.
2. Train employees on where to obtain first-aid and medical services.

VII. Recordkeeping Requirements

1. District Requirements

The designated representative will:

1. Have a copy of the contract on file and be thoroughly familiar with its contents, and with the safety and health aspects of the work.
2. Keep records of all training done with District workers regarding hazards to be caused by the contracting company.
3. Keep copies on file of all forms or statements related to the contract that are required by the District to be filled out before or during contract work.
4. Keep an OSHA recordable injury and illness log for the project, as well as copies of accident reports on all accidents that occur in the course of the project.
5. Keep a daily log regarding pre-work start-up inspection findings.
6. Keep records of all documentation of any sort provided by the contractor, including records of training done, MSDSs, accident reports, etc.
7. Keep records of all documentation of any sort provided to the contractor, including list of hazards to train their employees on, MSDSs, etc.
8. Document all discussions, letters, memos, or other communications made to the contractor regarding safety issues, including place, time, names of people involved