



**Purchasing Department
113 Mable T. Willis Blvd.
Walterboro, SC 29488
843.782.0504**

BID: FM-52
SEWER PUMP STATION AND FORCE MAIN
AT THE
COLLETON COUNTY CAREER SKILLS CENTER

Due: Wednesday, January 29, 2020 @ 11:00am

MAIL OR DELIVER RESPONSE TO:

Purchasing Department
Attn: Kaye B Syfrett
113 Mable T. Willis Blvd.
Walterboro, SC 29488

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A. OVERVIEW

Colleton County, South Carolina (the "**County**") request bids from qualified, license contractors to construct a sanitary sewer grinder pump station and install 300 LF of PVC force main at the Colleton County Career Skills Center located at 1085 Thunderbolt Drive in Walterboro.

Subject to the terms, conditions, provisions, and the enclosed specifications, responses to this solicitation will be received at this office until the stated date and time. Responses received after the scheduled due date and time will be rejected. Bids must be submitted in a sealed package marked on the outside with the Contractor's name, address, and the solicitation name and number.

This solicitation does not commit Colleton County to award a contract, to pay any costs incurred in the preparation of bids submitted, or to procure or contract for the services. The County reserves the right to accept or reject or cancel in part, or in its entirety offers received because of this request if deemed to be in the best interest of the County to do so.

Questions regarding this solicitation must be submitted via emailed to **Carla Harvey, County Engineer at charvey@colletoncounty.org** no later than **11:00AM on Wednesday, January 22, 2020**. Answers to all questions will be posted on the County website as addendums to this bid.

B. SCOPE OF WORK

The project includes grinder pump and force main installation as well as connection to the building of the new sewer system. Drawings and specifications included in the solicitation. It will be the responsibility of the contractor for coordination with the local utility providers and for making the necessary adjustments.

This contract is a unit price contract. Quantities provided are estimates only.

C. INSTRUCTIONS TO CONTRACTOR

1. Submittal must include **one (1) original bid** response clearly marked as original, and **one (1) complete copies** of the Contractor's bid along with a completed **W-9 form**. Responses must be in a sealed envelope/package marked on the outside with the Contractor's name, address, and the solicitation name and number. The individual signing the response must be an Agent legally authorized to bind the company.
2. Show solicitation number on the outside of mailing package. Colleton County assumes no responsibility for unmarked or improperly marked envelopes.
3. It is the Contractor's sole responsibility to ensure that solicitation responses, amendments thereto or withdrawal requests are submitted by the scheduled due date and time.
4. The Contractor must clearly mark as "Confidential" each part of their response, which they consider to be proprietary information that could be exempt from disclosure under Section 30-40(C) Code of Laws of South Carolina, 1976, Freedom of Information Act. Colleton County reserves the right to determine whether this information should be exempt from disclosure and legal action may not be brought against the County or its agents for its determination in this regard.

5. The Contractor shall complete and submit all forms listed in the **Bid Forms** of the table of contents. All responses shall be printed in ink or typewritten. Bids written in pencil will be disqualified.
6. Each Contractor shall submit with his/her Bid a Bid Bond with a good and sufficient surety or sureties company licensed in South Carolina, in the amount of five percent (5%) of the total Bid amount. The Bid bond penalty may be expressed in terms of a percentage of the Bid price or may be expressed in dollars and cents.
7. The successful contractor shall pay the cost and furnish within ten (10) days after written notice of acceptance of Bid, an irrevocable Surety in the form of a Performance and Payment Bond, Certificate of Deposit, Cashier's Check or irrevocable letter of credit. Performance Bond shall include a one-year warranty of workmanship and materials and shall commence upon completion and acceptance of the total contract by Colleton County. The Surety shall be issued in the amount of 100% of the total contract covering the entire term of the contract as awarded. The cost of performance bond is to be included in the unit prices listed on the bid form.

A "No Response" qualifies as a response; however, it is the responsibility of the Contractor to notify the Procurement Manager if you receive solicitations that do not apply.

D. SELECTION CRITERIA

It is the intent of Colleton County to award one contract to the lowest responsive, responsible bidder based on the estimated quantities on the Bid Form. The County reserves the right to accept or reject all bids if deemed to be in the best interest of the County to do so.

E. SPECIFIC TERMS AND CONDITIONS

1. **COMPETITION:** This solicitation is intended to promote full and open competition. If any language, specifications, terms and conditions, or any combination thereof restricts or limits the requirements in this solicitation to a single source, it shall be the responsibility of the interested Contractor to notify the Procurement Office in writing no later than five (5) business days prior to the scheduled due date and time.
2. **RESPONDANTS QUALIFICATION:** The County reserves the right to request satisfactory evidence of their ability to furnish services in accordance with the terms and conditions listed herein. The County further reserves the right to make the final determination as to the Contractor's ability to provide said services.
3. **RESPONSE WITHDRAWAL:** Any responses may be withdrawn prior to the established closing date and time, but not thereafter with proper approval from the Procurement Manager.
4. **REJECTION:** Colleton County reserves the right to reject any and all bids, to cancel or withdraw this solicitation, and to waive any technicality if deemed to be in the best interest of the County.
5. **WAIVER:** The County reserves the right to waive any Instruction to Contractors, General or Special Provisions, General or Special Conditions, or specifications deviation if deemed to be in the best interest of the County.
6. **RESPONSE PERIOD:** All responses shall be good for a minimum period of 60 calendar days.

7. DEVIATIONS FROM SPECIFICATIONS: Any deviation from specifications indicated herein must be clearly pointed out; otherwise, it will be considered that items offered are in strict compliance with these specifications, and successful Contractor will be held responsible therefore. Deviations must be explained in detail on separate attached sheet(s). The listing of deviations, if any, is required but will not be construed as waiving any requirements of the specifications. Unidentified deviations found during the evaluation of the response may be cause for rejection.
8. AMENDMENTS: All amendments to and interpretations of this solicitation shall be in writing and issued by the Procurement Manager of Colleton County.
9. DEBARMENT: By submitting a qualification package, the Contractor is certifying that they are not currently debarred from responding to any request for bids by any agency or subdivision of the State of South Carolina or the United States Federal Government, nor are they an agent of any person or entity that is currently debarred from submitting bids on contracts by any agency or subdivision of the State of South Carolina.
10. DEFAULT: In case of default by the Contractor, the County reserves the right to purchase any or all items in default in the open market, charging the Contractor with any excessive costs. Should such charge be assessed, no subsequent solicitation response of the defaulting Contractor will be considered in future bids until the assessed charge has been satisfied.
11. HOLD HARMLESS: All respondents to this bid shall indemnify and hold harmless Colleton County Government and any of their officers and employees from all suits and claims alleged to be a result of this request for bids. The issuance of this request of bids constitutes only an invitation to present a bid. Colleton County reserves the right to determine, at its sole discretion, whether any aspect of a respondent's submittal meets the criteria in this request for proposals. Colleton County also reserves the right to seek clarifications, to negotiate with any Contractor submitting a response, to reject any or all responses with or without cause, and to modify the procurement process and schedule.
12. CANCELLATION: In the event that this request for bids is withdrawn or the project canceled for any reason, Colleton County shall have no liability to any respondent for any costs or expenses incurred in connection with this request for bids or otherwise.
13. COLLETON COUNTY PURCHASING ORDINANCE: The Request of Bids is subject to the provisions of the Colleton County Purchasing Ordinance and any revisions thereto, which are hereby incorporated into this request for bids in their entirety except as amended or superseded within. This ordinance can be found at <https://www.municode.com/library/sc/colletoncounty/codes/codeofordinances> under Title 3 - Revenue and Finance.
14. FAILURE TO SUBMIT ALL MANDATORY FORMS: Failure to submit all the mandatory forms from this request of bids shall be just cause for the rejection of the qualification package. However, Colleton County reserves the right to decide, on a case by case basis, in its sole discretion, whether or not to reject such a bid as non-responsive.
15. CONTRACT AWARD:
 - a. This solicitation and submitted documents, when properly accepted by Colleton County shall constitute an agreement equally binding between the successful Contractor and the County. No oral statement of any person shall modify or otherwise change, or affect the terms, conditions or specifications stated in the resulting agreement. The County shall not be legally bound by any amendment or interpretation that is not fully executed by both parties in writing.

- b. The successful Contractor shall be required to execute a formal agreement with the County's Procurement Office within ten (10) business days after issuance of the Notice of Award.
16. CONTRACT ADMINISTRATION: Questions or problems arising after award of an agreement shall be directed to the Procurement Manager by calling (843) 539-1968. Copies of all correspondence concerning this solicitation or resulting agreement shall be sent to the Procurement Office, 113 Mable T. Willis Blvd, Walterboro, SC 29488.

F. GENERAL CONTRACTUAL REQUIREMENTS

1. ABANDONMENT OR DELAY: If the work to be done under this contract shall be abandoned or delayed by the Contractor, or if at any time the County shall be of the opinion and shall so certify in writing that work has been abandoned or delayed by the Contractor, the County may annul the contract or any part thereof if the Contractor fails to resolve the matter within thirty (30) days of written notice.
2. CONTRACTOR'S COOPERATION: The Contractor shall maintain regular communications with the Project Manager and shall actively cooperate in all matters pertaining to this contract.
3. RESPONSIBILITY: The Contractor shall always observe and comply with all federal, state, local and municipal laws, ordinances, rules and regulations in any manner affecting the contract.
4. NON-APPROPRIATION / SUBSTITUTION PERMITTED: If the Colleton County Council fails to appropriate or authorize the expenditure of sufficient funds to provide the continuation of this contract or if a lawful order issued in, or for any fiscal year during the term of the agreement, reduces the funds appropriated or authorized in such amounts as to preclude making the payments set out therein, the agreement shall terminate on the date said funds are no longer available without any termination charges or other liability incurring to County. Following any such non-appropriation, the master lease agreement shall contain no limitation on the County's ability to replace the equipment financed with any other equipment.
5. INDEMNIFICATION: Except for expenses or liabilities arising from the negligence of the County, the Contractor hereby expressly agrees to indemnify and hold the County harmless against any and all expenses and liabilities arising out of the performance or default of any resulting agreement or arising from or related to the Work as follows:

Contractor expressly agrees to the extent that there is a causal relationship between its negligence, action or inaction, or the negligence, action or inaction of any of its employees or any person, Contractor, or corporation directly or indirectly employed by the Contractor, and any damage, liability, injury, loss or expense (whether in connection with bodily injury or death or property damage or loss) that is suffered by the County and its employees or by any member of the public, to indemnify and save the County and its employees harmless against any and all liabilities, penalties, demands, claims, lawsuits, losses, damages, costs, and expenses arising out of the performance or default of any resulting agreement or arising from or related to the equipment. Such costs are to include defense, settlement and reasonable attorneys' fees incurred by the County and its employees. This promise to indemnify shall include bodily injuries or death occurring to Contractor's employees and any person, directly or indirectly employed by Contractor (including without limitation any employee of any subcontractor), the County's employees, the employees of any other independent contractor, or occurring to any member of the public. When the County submits notice, Contractor shall promptly defend any aforementioned action.

The prescribed limits of insurance set forth herein shall not limit the extent of the Contractor's responsibility under this Section. The terms and conditions contained in this Section shall survive the termination of any resulting agreement or the suspension of the Work hereunder. Additionally, the County will not provide indemnity to the successful CONTRACTOR. Failure to comply with this section may result in your request for bid to be deemed non-responsive.

6. **FORCE MAJEURE:** The Contractor shall not be liable for any excess costs if the failure to perform the resulting agreement arises out of causes beyond the control and without fault or negligence of the Contractor. Such causes may include, but are not restricted to acts of God or of the public enemy, acts of the Government in either its sovereign or contractual capacity, fires, floods, epidemics, quarantine restrictions, strikes, freight embargoes, and unusually severe weather; but in every case the failure to perform must be beyond the control and without the fault or negligence of the contractor. If the failure to perform is caused by default of a subcontractor, and if such default arises out of causes beyond the control of both the Contractor and subcontractor and without excess costs for failure to perform, unless the supplies or services to be furnished by the subcontractor were obtainable from other sources in sufficient time to permit the contractor to meet the required delivery schedule.
7. **ARBITRATION:** Under no circumstances and with no exception will Colleton County act as arbitrator between the Contractor and any sub-contractor.
8. **PUBLICITY RELEASES:** Contractor agrees not to refer to award of this contract in commercial advertising in such a manner as to state or imply that the products or services provided are endorsed or preferred by the County. The Contractor shall not have the right to include the County's name in its published list of customers without prior approval of the County Administrator. With regards to news releases, only the name of the County, type and duration of any resulting agreement may be used and then only with prior approval of the County. The Contractor also agrees not to publish, or cite in any form, any comments or quotes from the County's staff unless it is a direct quote from the Procurement Manager.
9. **GOVERNING LAWS:** Any agreement arising from this solicitation shall be governed by the laws of the State of South Carolina and all disputes arising out of said agreement shall, if litigation is necessary, be litigated only in a Circuit Court for the Fourteenth Judicial Circuit sitting in Colleton County, South Carolina. The prevailing party shall be entitled to attorney's fees and all costs of said litigation.
10. **ASSIGNMENT:** The Contractor shall not assign in whole or in part any agreement resulting from this Request for Bids without the prior written consent of the County. The Contractor shall not assign any money due or to become due to him under said agreement without the prior written consent of the County.
11. **AFFIRMATIVE ACTION:** The successful Contractor will take affirmative action in complying with all Federal and State requirements concerning fair employment and treatment of all employees, without regard or discrimination by reason of race, color, religion, sex, national origin or physical handicap.
12. **FAILURE TO DELIVER GOODS IN ACCORDANCE WITH TERMS & CONDITIONS:** In case of failure to deliver goods in accordance with the contract terms and conditions, Colleton County, after due oral or written notice, may procure substitute goods or services from other sources and hold the contractor responsible for any resulting additional purchasing and administrative costs. This remedy shall be in addition to any other remedies which Colleton County may have.
13. **TERMINATION OF CONTRACT:**

1. Subject to the Provisions below, the contract may be terminated by the Purchasing Department providing a thirty (30) days advance notice in writing is given to the Contractor.
 - a. Termination for Convenience: In the event that this contract is terminated or canceled upon request and for the convenience of the County without the required thirty (30) days advance written notice, then the County shall negotiate reasonable termination costs, if applicable.
 - b. Termination for Cause: Termination by the County for cause, default or negligence on the part of the Contractor shall be excluded from the foregoing provisions; termination costs, if any, shall not apply. The thirty (30) days advance notice requirement is waived and the default provision in this request for bids shall apply.
 - c. The County shall be obligated to reimburse the Contractor only for those services rendered prior to the date of notice of termination, less any liquidation damages that may be assessed for non-performance.
2. Non-Appropriations Clause: Notwithstanding any other provisions of the contract, if the funds anticipated for the continued fulfillment of this contract are at any time. Not forthcoming, through the failure of the County Government to appropriate funds, discontinuance or material alteration of the program under which funds were provided, the County shall have the right to terminate the contract without penalty by giving not less than thirty (30) days written notice documenting the lack of funding. Unless otherwise agreed to by the County and the Contractor, the contract shall become null and void on the last day of the fiscal year for which appropriations were received.
14. GOVERNING LAWS: Any contract resulting from this request for bids shall be governed in all respects by the laws of the State of South Carolina and any litigation with respect thereto shall be brought in the courts of the State of South Carolina.
15. TESTING: The contractor will be responsible for all quality control and testing.
16. TOTAL CONTRACT TIME: The total contract time for this project is 120 calendar days. Work on this project may commence with the Notice to Proceed.
17. RETAINAGE: The County reserves the right to withhold 10% retainage on all pay applications. Retainage withheld will be paid out on the final pay application following the completion of project and all punch list items addressed.
18. WARRANTY: The Contractor agrees to a one-year warranty against defects, failures etc. caused by materials and workmanship, beginning on the date of final acceptance of punch list.
19. BONDS: Payment and Performance Bonds are required for this request for bids.
20. OWNERSHIP OF MATERIAL: Ownership of all data, material, and documentation originated and prepared for the County pursuant to this contract shall belong exclusively to the County.
21. INSURANCE: Colleton County will require the following remain in force at all times through the life of the contract:
Professional Liability Insurance – Minimum \$1,000,000.00 - Proof of in force insurance must be provided in the response to the RFB

Other insurances:

Workers' Compensation - \$100,000 – each accident
Statutory Coverage and Employer's - \$100,000 each employee
Liability - \$500,000 – policy limit

Comprehensive General Liability -\$2,000,000 – bodily injury each occurrence
\$2,000,000 – bodily injury aggregate
\$2,000,000 – property damage each occurrence
\$2,000,000 – property damage aggregate
Products – Completed Operations - \$1,000,000 – aggregate
Business Auto Liability – Same as Comprehensive General Liability
Excess or Umbrella Liability - \$2,000,000

Colleton County will be named as an “additional insured”

G. SPECIAL PROVISIONS & SPECIFICATIONS

See Appendix A

H. DRAWINGS

See Appendix B

I. BID FORMS



BID: FM-52
SEWER PUMP STATION AND FORCE MAIN
BID FORM

Bidder will complete the Work in accordance with the Contract Documents as outlined below for the cost listed in the following bid schedule. *Bid items shall include all associated labor, equipment, materials, and associated appurtenances.*

A. BASE BID ITEMS:

1. SS Duplex Pump Station:

Installation of a complete Duplex Pump Station facility, as specified in contract documents herein.

Pump-Station work/bid item shall include:

1. Wet-well
2. Concrete Pump Station Pad
3. Control Panel and Mounting Pedestal/Appurtenance
4. Underground Power Supply (*standard electrical conduit*)
5. Pumps and Pump Controls
6. Influent Pipe and Fittings
7. Effluent Pipe and Fittings
8. Check Valve and Valve Box
9. Plug Valve and Valve Box

Note: 1.) Pump Station work/bid shall include all associated unions and appurtenances necessary for a complete operational pump station, per contract documents herein. 2.) Pump station division of work terminates at end of the open-cut section and the pipe fitting connection to the directionally bored force-main section.

2. Force-Main Installation:

Install 2-inch diameter Force-Main, to include:

1. Approximately 301 LF of directionally bored, C-900 PVC or Fusible HDPE, pipe (*per written Specification, Section 15100*). To include all associated bore pits and installation equipment (*per written Specification, Section 02401*).
2. Open Cut section and Drop Connection to the existing SS manhole, as specified in contract drawings and specifications herein.

Force-Main work shall include all associated unions and bends and appurtenances necessary for a complete operational force-main, per contract documents herein.

BASE BID PRICE					
Item	Description	Plan Quantity	Unit Measure	Unit Price	Totals
SS - Duplex Pump Station					
1	Wet-Well	1	JOB		
2	Concrete Pump-Station Pad	1	JOB		
3	Control Panel and Mounting Pedestal	1	JOB		
4	Underground Power	1	JOB		
5	Pumps and Pump Controls	1	JOB		
6	Influent Pipe and Fittings	1	JOB		
7	Effluent Pipe and Fittings	1	JOB		
8	Check Valve and Valve Box	1	JOB		
9	Plug Valve and Valve Box	1	JOB		
Force-Main					
10	HDD section	301	LF		
11	Open Cut Section and Manhole Drop	1	JOB		

TOTAL BASE BID PRICE:

_____ (\$ _____)
(use words) *(figures)*

B. ALTERNATE BID ITEMS:

Pursuant to the Project Facility's lower flow, certain smaller package systems may be available at a reduced cost. Therefore, the Owner reserves the right to consider and accept an Alternate Bid, which meets acceptable engineering requirements and standards.

The Bid Alternate must meet the basic design elements as specified herein, the Contract Drawings and Written Specifications.

Given the Projects deeper inverts, any systems utilizing smaller diameter wet-wells must include convenient maintenance access for the pumps and wet-well equipment.

Bidder shall supply Alternate Pump-Station Bid along with all technical specifications necessary for Owner /Engineer's review and approval.

Please Note:

*If a Pump-Station alternate is submitted which does **NOT** meet the necessary engineering and design standards the Bid will be evaluated using the Pump-Station Base-Bid; if a Base-Bid is not supplied the bid will be disqualified.*

ALTERNATE PRICE BID					
Item	Description	Plan Quantity	Unit Measure	Unit Price	Totals
1.	Package Pump Station	1	JOB		

TOTAL BASE BID PRICE:

_____ (\$ _____)
(use words) *(figures)*

Contractor: _____ Date: _____

Address: _____

City: _____ State: _____ Zip: _____

Telephone Number:() _____

Signature: _____

Print name: _____

Title: _____

Email: _____

THIS PAGE MUST BE COMPLETED AND SUBMITTED AS A PART OF YOUR BID

REFERENCE FORM

REFERENCE FORM

(Please use this form or similar copy)

Bidder shall include a list of three references for similar work with bid response. References shall include project name, brief description and location of project, completed dollar amount of project, date completed, contact person's name, phone, fax number, and email address of a similar job completed

- 1.) Name of Project Owner: _____
Brief Description Including Location _____

Completed Dollar Amount: \$ _____ Date Completed: _____
Contact Person's Name: _____
Contact Phone: (_____) _____ - _____ Contact Fax: (_____) _____ - _____
Contact E-mail: _____

- 2.) Name of Project Owner: _____
Brief Description Including Location _____

Completed Dollar Amount: \$ _____ Date Completed: _____
Contact Person's Name: _____
Contact Phone: (_____) _____ - _____ Contact Fax: (_____) _____ - _____
Contact E-mail: _____

- 3.) Name of Project Owner: _____
Brief Description Including Location _____

Completed Dollar Amount: \$ _____ Date Completed: _____
Contact Person's Name: _____
Contact Phone: (_____) _____ - _____ Contact Fax: (_____) _____ - _____
Contact E-mail: _____

- 4.) Name of Project Owner: _____
Brief Description Including Location _____

Completed Dollar Amount: \$ _____ Date Completed: _____
Contact Person's Name: _____
Contact Phone: (_____) _____ - _____ Contact Fax: (_____) _____ - _____
Contact E-mail: _____

THIS PAGE MUST BE COMPLETED AND SUBMITTED AS A PART OF YOUR BID

SUBCONTRACTOR FORM

SUBCONTRACTOR FORM

Subcontractor Name: _____

Address: _____

Description of Work to be Performed: _____

Dollar Value of Subcontractor's Work: \$ _____ Percentage of Contract Value: _____

Subcontractor Name: _____

Address: _____

Description of Work to be Performed: _____

Dollar Value of Subcontractor's Work: \$ _____ Percentage of Contract Value: _____

Subcontractor Name: _____

Address: _____

Description of Work to be Performed: _____

Dollar Value of Subcontractor's Work: \$ _____ Percentage of Contract Value: _____

Subcontractor Name: _____

Address: _____

Description of Work to be Performed: _____

Dollar Value of Subcontractor's Work: \$ _____ Percentage of Contract Value: _____

Subcontractor Name: _____

Address: _____

Description of Work to be Performed: _____

Dollar Value of Subcontractor's Work: \$ _____ Percentage of Contract Value: _____

Subcontractor Name: _____

Address: _____

Description of Work to be Performed: _____

Dollar Value of Subcontractor's Work: \$ _____ Percentage of Contract Value: _____

THIS PAGE MUST BE COMPLETED AND SUBMITTED AS A PART OF YOUR BID



BID: FM-52
SEWER PUMP STATION AND FORCE MAIN
ADDENDA ACKNOWLEDGMENT

The Contractor has examined and carefully studied the Request for Bids and the following Addenda, receipt of all of which is hereby acknowledged:

Addendum No. _____

Addendum No _____

Addendum No. _____

Addendum No. _____

Authorized Representative/Signature

Date

Authorized Representative/Title (Print)

The contractor must acknowledge any issued addenda. Bids which fail to acknowledge the vendor's receipt of any addendum will result in the rejection of the offer if the addendum contained information which substantively changes the Owner's requirements or pricing.

THIS PAGE MUST BE COMPLETED AND SUBMITTED AS A PART OF YOUR BID



BID: FM-52
SEWER PUMP STATION AND FORCE MAIN
INDEMNIFICATION

The Contractor will indemnify and hold harmless the Owner, Colleton County and their agents and employees from and against all claims, damages, losses and expenses, including attorney’s fees, arising out of or resulting from the performance of the Work provided that any such claims, damages, loss, or expense is attributable to bodily injury, sickness, disease or death, injury to or destruction of tangible property, including the loss of use resulting there from, and is caused by any negligent or willful act or omission of the Contractor, and anyone directly or indirectly employed by him/her or anyone for whose acts any of them may be liable.

In any and all claims against the Owner, Colleton County or any of their agents and/or employees by an employee of the Contractor, and anyone directly or indirectly employed by any of them, or anyone for whose acts any of them may be liable, the indemnification obligation shall not be limited in any way to the amount or type of damages, compensation or benefits payable by or for the Contractor under the Worker’s Compensation Acts, Disability Benefit Acts, or other employee benefit acts.

The obligation of the Contractor under this paragraph shall not extend to the liability of Colleton County or its agents and/or employees arising out of the reports, surveys, Change Orders, designs or Technical Specifications.

Authorized Representative (Signature)

Date

Authorized Representative/Title (Print or Type)

THIS PAGE MUST BE COMPLETED AND SUBMITTED AS A PART OF YOUR BID



BID: FM-52

**SEWER PUMP STATION AND FORCE MAIN
CERTIFICATE OF FAMILIARITY**

The undersigned, having fully familiarized him/her with the information contained within this entire solicitation and applicable amendments, submits the attached response, and other applicable information to the County, which I verify to be true and correct to the best of my knowledge. I further certify that this response is made without prior understanding, agreement, or connection with any corporation, Contractor or person submitting a response for the same materials, supplies or equipment, and is in all respects, fair and without collusion or fraud. I agree to abide by all conditions set forth in this solicitation and certify that I have signature authority to bind the company listed herein.

MINORITY BUSINESS: Are you a minority business?

- ▶ Yes __ (___ Women-owned / ___ Disadvantaged) *If yes, please submit a copy of your certificate with your response.*
- ▶ No _____

Authorized Representative (Signature)

Date

Authorized Representative/Title (Print or Type)

THIS PAGE MUST BE COMPLETED AND SUBMITTED AS A PART OF YOUR BID



BID: FM-52
SEWER PUMP STATION AND FORCE MAIN
DEBARMENT

The contractor is certifying that they are not currently debarred from responding to any request for bids by any agency or subdivision of the State of South Carolina or the United States Federal Government, nor are they an agent of any person or entity that is currently debarred from submitting bids on contracts by any agency or subdivision of the State of South Carolina or the United States Federal Government.

SAM's No. _____

Cage Code. _____

DUN's No. _____

Authorized Representative/Signature

Date

Authorized Representative/Title (Print)

THIS PAGE MUST BE COMPLETED AND SUBMITTED AS A PART OF YOUR BID

APPENDIX A - SPECIAL PROVISIONS & SPECIFICATIONS

TECHNICAL SPECIFICATIONS
FOR
SKILL CENTER PUMP STATION AND FORCEMAIN

Prepared for
COLLETON COUNTY, SC
AUGUST 2019

Prepared By

BLACKWATER CIVIL ENGINEERING
792 Williams Rd. Ruffin, SC 29475

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DIVISION 01 – GENERAL REQUIREMENTS

**SECTION 01300
SUBMITTALS
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**SECTION 01300
SUBMITTALS**

PART 1. GENERAL

1.1 SECTION INCLUDES

- A. Pre-Bid Submittal for Equipment and Materials
- B. Submittal Procedures
- C. Construction Progress Schedules
- D. Product Data
- E. Shop Drawings
- F. Samples
- G. Design Data
- H. Test Reports
- I. Certificates
- J. Manufacturer's Instructions
- K. Manufacturer's Field Reports
- L. Erection Drawings

1.2 RELATED SECTIONS

- A. Section 01701 – Contract Closeout Procedures – Contract warranties, bonds, manufacturers' certificates, and closeout submittals.

1.3 PRE-BID SUBMITTAL FOR EQUIPMENT AND MATERIALS

- A. Equipment specifications are provided in the Plan Set and this Specification, to identify a standard or quality required in this project. Alternate equipment or materials may be utilized by and furnished by the Contractor when such equipment or material has been approved by the Owner. Pre-bid submittals shall be submitted to the Owner /Engineer for pre-approval.
- B. Listing of substitute equipment and materials does not constitute approval. Final

approval will be made after bids are received if a substitute equipment or materials affects the low bids and if the substitute equipment and materials is determined to be equal to the specifications based on the pre-submittal received.

- C. THE PRE-BID SUBMITTALS SHALL LIST ANY AND ALL DEVIATIONS FROM SPECIFICATIONS.

1.4 SUBMITTAL PROCEDURES

- A. Deliver submittals to Owner /Engineer in acceptable form.
- B. Identify Project, Contractor, Subcontractor or supplier; pertinent drawing and detail number, and specification section number, as appropriate.
- C. Apply Contractor's stamp, signed or initialed certifying that review, approval, verification of Products required, field dimensions, adjacent construction work and coordination of information is in accordance with the requirements of the work and Contract Documents. Submittal without the Contractor's stamp will be returned to Contractor without Owner /Engineer's review.
- D. Make all submittals far enough in advance of scheduled dates for installation to provide all required time for reviews, for securing necessary approvals, for possible revision and resubmittal, and for placing orders and securing delivery. In scheduling, allow sufficient time for the Owner /Engineer's review following the receipt of the submittal.
- E. Identify variations from Contract Documents and Product or system limitations which may be detrimental to successful performance of the completed work.
- F. Provide space for Contractor and Owner /Engineer review stamps.
- G. When revised for resubmission, identify all changes made since previous submission.

1.5 CONSTRUCTION PROGRESS SCHEDULES

- A. Submit initial schedule within 15 days after date established in Notice to Proceed.
- B. After reviewed by the Owner /Engineer, revise and resubmit as required.
- C. Submit revised schedules, as necessary, with each Application for Payment, identifying changes since previous version.

- D. Indicate submittal dates required for shop drawings, product data, samples, and product delivery dates, including those furnished by Owner and required by Allowances.

1.6 PRODUCT DATA

NOT USED

1.7 SHOP DRAWINGS

- A. Contractor shall submit a minimum two (2) copies of each shop drawing to the Owner /Engineer for review.
- B. Submitted to Engineer for review for the limited purpose of checking for conformance with information given and the design concept expressed in the contract documents. Review of shop drawings by Owner /Engineer shall not relieve Contractor of his responsibility for the accuracy of the shop drawings for the furnishing of all materials and equipment required by the contract even though such items may not be indicated on the shop drawings reviewed by Owner /Engineer.
- C. Shop drawings shall include applicable technical information, drawings, diagrams, performance curves, schedules, templates, calculations, instructions, measurements and similar information as applicable to the specific item for which the shop drawing is prepared.
- D. Do not use Engineer's Drawings for shop or erection purposes.
- E. Each shop drawing copy shall bear a Contractor's stamp showing they have been checked. Shop drawings submitted to the Owner /Engineer without the Contractor's stamp may be returned to the Contractor without review.

1.8 SAMPLES

NOT USED

1.9 DESIGN DATA

NOT USED

1.10 TEST REPORTS

- A. Submit for the Owner /Engineer's knowledge as contract administrator or for the owner.
- B. Submit test reports for information for the limited purpose of assessing conformance

with information given and the design concept expressed in the contract documents.

1.11 CERTIFICATES

- A. When specified in individual specification sections, submit certification by the manufacturer, installation/application subcontractor, or the Contractor to Owner /Engineer, in quantities specified for product Data.
- B. Indicate material or product conforms to or exceeds specified requirements. Submit supporting reference data, affidavits, and certifications as appropriate.
- C. Certificates may be recent or previous test results on material or Equipment /Product, but must be acceptable to Owner /Engineer.

1.12 MANUFACTURER'S INSTRUCTION

- A. When specified in individual specification sections, submit printed instructions for delivery, storage, assembly, installation, start-up, adjusting, and finishing, to Engineer for delivery to Owner in quantities specified for Product Data.
- B. Indicate special procedures, perimeter conditions requiring special attention, and special environmental criteria required for application or installation.

1.13 MANUFACTURER'S FIELD REPORTS

NOT USED

1.14 ERECTION DRAWINGS

NOT USED

1.15 REVIEWED SHOP DRAWINGS

- A. Engineer Review –
 - 1. Acceptable submittals will be marked "Approved." A minimum of one (1) copy will be retained by the Owner /Engineer for their
 - 2. Submittals requiring minor corrections before the product is acceptable will be marked "Furnish as Corrected." The Contractor may order, fabricate and ship the items included in the submittals provided the indicated corrections are made.
 - 3. Submittals marked "Revise and Submit" must be revised to reflect required

changes and the initial review procedure repeated.

4. The “Rejected” notation is used to indicate products which are not acceptable. Upon return of a submittal so marked, the Contractor shall repeat the initial review procedure utilizing acceptable products.
 5. Only two copies of items marked “Revise and Submit” and “Rejected” will be reviewed and marked. One copy will be retained by the Engineer and the other copy with all remaining unmarked copies will be returned to the Contractor for resubmittal.
- B. No work or products shall be installed without a drawing or submittal bearing the “Approved” or “Furnish as Corrected” notation. The Contractor shall maintain at the job site a complete set of shop drawings bearing the Engineer’s stamp.
- C. Substitutions – In the event the Contractor obtains the Engineer’s approval for the use of products other than those which are listed first in the Contract Documents, the Contractor shall, at the Contractor’s own expense and using methods approved by the Engineer, make any changes to structures, piping and electrical work that may be necessary to accommodate these products.
- D. Use of the “Approved” or “Furnish as Corrected” notation on shop drawings or other submittals is general and shall not relieve the Contractor of the responsibility of furnishing products of the proper dimension, size, quality, quantity, materials and all performance characteristics, to efficiently perform the requirements and intent of the Contract Documents. The Engineer’s review shall not relieve the Contractor of the responsibility of errors of any kind on the shop drawings. Review is intended only to assure conformance with the design concept of the Project and compliance with the information given in the Contract Documents.

1.16 SUBMITTAL CHECKLIST (Not Used)

PART 2. PRODUCTS (Not Used)

PART 3. EXECUTION (Not Used)

END OF SECTION

**SECTION 01410
TESTING SERVICES
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**SECTION 01410
TESTING SERVICES**

PART 1. GENERAL

1.1 SECTION INCLUDES

- A. Selection and Payment
- B. Contractor Submittals
- C. Testing Agency Responsibilities
- D. Testing Agency Reports
- E. Limits on Testing Authority
- F. Contractor Responsibilities
- G. Schedule of Tests

1.2 RELATED SECTIONS

- A. Testing and approvals required by public authorities.
- B. Section 01300 – Submittals – Manufacturer’s Certificates.

1.3 REFERENCES

- A. ASTM C 802-87 – Practice for Conducting an Interlaboratory Test Program to Determine the Precision of Test Methods for Construction.
- B. ASTM C 1077-92 – Practice for Laboratories Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Laboratory Evaluation.
- C. ASTM D 3740-92 – Practice for Evaluation of Agencies Engaged in Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction.
- D. ASTM E 329-93 – Practice for Use in the Evaluation of Inspection and Testing Agencies as Used in Construction.
- E. ASTM E 543-93 – Practice for Determining the Qualification of Nondestructive Testing Agencies.
- F. ASTM E 548-93 – Practice for Preparation of Criteria for Use in the Evaluation of

Testing Laboratories and Inspection Bodies.

- G. ASTM E 699-79 (Reapproved 19910 – Practice for Criteria for Evaluation of Agencies Involved in Testing, Quality Assurance, and Evaluating Building Components in Accordance with Test Methods Promulgated by ASTM Committee E6.

1.4 SELECTION AND PAYMENT

- A. The Contractor will employ and pay for all services of an independent testing agency or laboratory to perform specified testing.
- B. Employment of testing agency or laboratory in no way relieves Contractor of obligation to perform work in accordance with requirements of Contract Documents.

1.5 QUALITY ASSURANCE

- A. Comply with requirements of practices listed in paragraph 1.3.
- B. Laboratory – Authorized to operate in State in which Project is located.
- C. Laboratory Staff – Maintain a full time specialist on staff to review services.
- D. Testing Equipment – Calibrated at reasonable intervals with devices of an accuracy traceable to either National Bureau of Standards or accepted values of natural physical constants.

1.6 CONTRACTOR SUBMITTALS

- A. Prior to start of Work, submit testing laboratory name, address, and telephone number, and names of full time Engineer/Specialist and responsible Officer.
- B. Submit copy of report of laboratory facilities inspection made by Materials Reference Laboratory of National Bureau of Standards during most recent inspection, with memorandum of remedies of any deficiencies reported by the inspection.

1.7 TESTING AGENCY RESPONSIBILITIES

- A. Test samples of mixes submitted by Contractor.
- B. Provide qualified personnel at site. Cooperate with Engineer and Contractor in performance of services.
- C. Perform specified sampling and testing of Products in accordance with specified standards.

- D. Ascertain compliance of materials and mixes with requirements of Contract Documents.
- E. Promptly notify Engineer and Contractor of observed irregularities or non-conformance of Work or Products.
- F. Perform additional tests required by Engineer.
- G. Attend Preconstruction meetings and progress meetings.

1.8 TESTING AGENCY REPORTS

- A. After each test, promptly submit two copies of report to Engineer and to Contractor.
- B. Include –
 - 1. Date issued
 - 2. Project title and number
 - 3. Name of inspector
 - 4. Date and time of sampling or inspection
 - 5. Identification of product and specifications section
 - 6. Location in the Project
 - 7. Type of inspection or test
 - 8. Date of test
 - 9. Results of tests
 - 10. Conformance with Contract Documents
- C. When requested by Engineer, provide interpretation of test results.

1.9 LIMITS ON TESTING AUTHORITY

- A. Agency or laboratory may not release, revoke, alter, or enlarge on requirements of Contract Documents.
- B. Agency or laboratory may not approve or accept any portion of the Work.

- C. Agency or laboratory may not assume any duties of Contractor.
- D. Agency or laboratory has no authority to stop the Work.

1.10 CONTRACTOR RESPONSIBILITIES

- A. Deliver to agency or laboratory at designated location, adequate samples of materials proposed to be used which require testing, along with proposed mix designs.
- B. Cooperate with laboratory personnel, and provide access to the Work and to manufacturer’s facilities.
- C. Provide incidental labor and facilities –
 - 1. To provide access to work to be tested
 - 2. To obtain and handle samples at the site or at source of Products to be tested
 - 3. To facilitate tests
 - 4. To provide storage and curing of test samples
- D. Notify Engineer and laboratory 48 hours prior to expected time for operations requiring testing services.

1.11 SCHEDULE OF TESTS

Section	Test	Frequency	Date	Performed By	Notes
02200 – Earthwork					
	Compaction				
		Unpaved	1 test per horizontal layer per 10,000 sf of fill area		
		Paved	1 test per horizontal layer per 5,000 sf of subgrade		
		Proof Rolling	As necessary		
02560 – Wastewater Collection System					
	Start-up		Prior to acceptance of Pump Station		
	Drawdown		Prior to acceptance of Pump Station		
	Certification		Completion		
	Warranty		Completion		

SECTION 01410-6
TESTING SERVICES

Section	Test	Frequency	Date	Performed By	Notes
	Leakage		As necessary		
	Compaction				
		Traffic Areas	1 per 100 lf or less for each 4 ft. of depth		
		Non-Traffic Areas	1 per 500 lf or less for each 6 ft. of depth		
	Gravity – Air		[All lines]		
	Hydrostatic – Force Main		100 psi for 2 hours		
	Deflection		10% of system		
03300 – Cast-in-Place Concrete					
	Materials		As necessary		
	Mix Designs		1 per mix design		
	Strength		4 test cylinders for each 50 cy or less of each mix design placed daily		
	Slump		1 test per each set of cylinders		
	Air Content		1 test per each set of cylinders		
	Temperature		1 test per each set of cylinders		

PART 2. PRODUCTS (Not Used)

PART 3. EXECUTION (Not Used)

END OF SECTION

**SECTION 01730
OPERATIONS AND MAINTENANCE DATA
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SECTION 01730
OPERATIONS AND MAINTENANCE DATA

PART 1. GENERAL

1.1 SECTION INCLUDES

- A. Format and content of manuals.
- B. Instruction of Owner's personnel.
- C. Schedule of submittals.

1.2 RELATED SECTIONS

- A. Section 01300 – Submittals: Submittals procedures.
- B. Section 01740 – Warranties & Bonds
- C. Individual Specifications Sections: Specific requirements for operation and maintenance data.

1.3 QUALITY ASSURANCE

- A. Prepare instructions and data by personnel experienced in maintenance and operation of described products.

1.4 FORMAT

- A. Compile product data and related information appropriate for Owner's maintenance and operation of products furnished under work of this contract.
- B. Binders – Commercial quality, 8-1/2 x 11 inch - three D side ring binders with durable plastic/cloth covers; 2 maximum ring size. When multiple binders are used, correlate data into related consistent groupings.
- C. Cover – Identify each binder with typed or printed title OPERATION AND MAINTENANCE INSTRUCTIONS; identify title of Project, identify subject matter of contents.
- D. Provide tabbed dividers for each separate product and system, with typed description of product and major component parts of equipment.
- E. Test – Manufacturer's printed data, or typewritten data on 24-pound paper.
- F. Drawings – Provide with reinforced punched binder tab. Bind in with test; fold larger drawings to size of text pages.

- G. Arrange content by systems/process flow under section numbers and sequence of Table of Contents of this Project Manual.
- H. Provide four (4) sets of O & M Manuals.
- I. Manuals are to be delivered to the Engineer in complete sets as soon as they are available from the vendors. **DO NOT WAIT UNTIL END OF JOB TO DELIVER MANUALS.**

1.5 PROJECT CLOSEOUT NOTEBOOK

The Contractor shall provide four (4) project closeout notebooks which shall include the following:

- A. Table of Contents.
- B. Project Description.
 - 1. Project Title.
 - 2. Name, Address and Telephone number of Engineer.
 - 3. Name, Address and Telephone number of Engineer's subcontractor.
 - 4. Name, Address and Telephone number of General Contractor.
 - 5. Name, Address and Telephone number of all subcontractors.
- C. List the name of each major item of equipment with the name, address and telephone number of each supplier. Make reference to O & M file folder.
- D. List of all shop drawings and name, address and telephone number of each supplier (make reference to file folder).
- E. List all warranties, guaranties and bonds. Include a copy of each. Also, include name, address and telephone number of surety providing Performance Bond.

1.6 MANUAL FOR MATERIALS AND FINISHES

- A. NOT USED

1.7 MANUAL FOR EQUIPMENT AND SYSTEMS

- A. Each Item of Equipment and Each System – Include description of unit or system, and component parts. Identify function, normal operating characteristics, and limiting conditions. Include performance curves, with engineering data and tests,

and complete nomenclature and commercial number of replaceable parts.

- B. Panelboard Circuit Directories – Provide electrical service characteristics, controls and communications.
- C. Include color-coded wiring diagrams as installed.
- D. Operating Procedures – Include start-up, break-in, and routine normal operating instructions and sequences. Include regulation, control, stopping, shutdown, and emergency instructions. Include summer, winter, and any special operating instructions.
- E. Maintenance Requirements – Include routine procedures and guide for troubleshooting; disassembly, repair, and reassembly instructions; and alignment, adjusting, balancing, and checking instructions.
- F. Provide servicing and lubrication schedule, and list of lubricants required.
- G. Include manufacturer’s printed operation and maintenance instructions.
- H. Include sequence of operation by controls manufacturer.
- I. Provide original manufacturer’s parts list, illustrations, assembly drawings, and diagrams required for maintenance.
- J. Provide control diagrams by controls manufacturer as installed.
- K. Provide Contractor’s coordination drawings, with color-coded piping diagrams as installed.
- L. Provide charts of valve tag numbers, with location and function of each valve, keyed to flow and control diagrams.
- M. Provide list of original manufacturer’s spare parts, current prices, and recommended quantities to be maintained in storage.
- N. Additional requirements – As specified in individual product specification Sections.

1.8 INSTRUCTION OF OWNER PERSONNEL

- A. Before final inspection, provide necessary instruction to Owner’s designated personnel in operation, adjustment, and maintenance of products, equipment, and systems, at agreed upon times.

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OPERATIONS AND MAINTENANCE DATA

- B. For equipment requiring seasonal operation, perform instructions for other seasons six months.
- C. Use operation and maintenance manuals as basis for instruction. Review contents of manual with personnel in detail to explain all aspects of operations and maintenance.
- D. Prepare and insert additional data in Operation and Maintenance Manual when need for such data becomes apparent during instruction.

1.9 SUBMITTALS

- A. Submit two copies of preliminary draft or proposed formats and outlines of contents before start of Work. Engineer will review draft and return one copy with comments.
- B. For equipment, or component parts of equipment, put into service during construction and operated by owner, submit documents within ten (10) days after acceptance.
- C. Submit one copy of completed volumes in final form fifteen 15 days prior to final inspection. Copy will be returned after final inspection, with Engineer's comments. Review content of documents as required prior to final submittal.
- D. Submit four (4) copies of revised volumes of data in final form within ten (10) days after final inspection.

PART 2. PRODUCTS (Not Used)

PART 3. EXECUTION (Not Used)

END OF SECTION

**SECTION 01740
WARRANTIES AND BONDS
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**SECTION 01740
WARRANTIES AND BONDS**

PART 1. GENERAL

1.1 SECTION INCLUDES

- A. Preparation and submittal.
- B. Time and schedule of submittals.

1.2 RELATED SECTIONS

- A. Section 01730 – Operation and Maintenance Data
- B. Individual Specifications Sections – Warranties required for specific Products or Work

1.3 FORM OF SUBMITTALS

- A. Bind in commercial quality, 8-1/2 x 11 inch three-ring side binders with hardback, cleanable, plastic covers.
- B. Label cover of each binder with typed or printed title WARRANTIES AND BONDS, with title of Project; name, address and telephone number of Contractor and equipment supplier; and name of responsible principal.
- C. Table of Contents – Neatly typed, in the sequence of the Table of Contents of the Project Manual, with each item identified with the number and title of the specification Section in which specified, and the name of the product or work item.
- D. Separate each warranty or bond with index tab sheets keyed to the Table of Contents listing. Provide full information, using separate typed sheets as necessary. List Subcontractor, supplier, and manufacturer, with name, address, and telephone number of responsible principal.
- E. Provide plastic cardholder sleeve and insert business cards from all subcontractors and general contractors' personnel including on-site representative, project manager and owner of company. Insert into manual this "card file" after table of contents.

1.4 PREPARATION OF SUBMITTALS

- A. Obtain warranties and bonds, executed in duplicate by responsible Subcontractors, suppliers, and manufacturers, within ten (10) days after completion of the applicable item of work. Except for items put into use with Owner's permission, leave date of

beginning of time of warranty until the Date of Substantial Completion is determined. Provide three complete notebooks to the Engineer for distribution. The Owner will receive two copies and the engineer will retain one copy.

- B. Verify that documents are in proper form, contain full information, and are notarized.
- C. Co-execute submittals when required.
- D. Retain warranties and bonds until time specified for submittal.

1.5 TIME OF SUBMITTALS

- A. For equipment or component parts of equipment put into service during construction with Owner's permission, submit documents within ten (10) days after acceptance.
- B. Make other submittals within ten (10) days after Date of Substantial Completion, prior to final Application for Payment.
- C. For items of Work when acceptance is delayed beyond Date of Substantial Completion, submit within ten (10) days after acceptance, listing the date of acceptance as the beginning of the warranty period.

PART 2. PRODUCTS – NOT USED

PART 3. EXECUTION – NOT USED

END OF SECTION

DIVISION 02 – SITE CONSTRUCTION

**SECTION 02315
EXCAVATION, TRENCHING, AND BACKFILL FOR UTILITY SYSTEMS
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SECTION 02315
EXCAVATION, TRENCHING, AND BACKFILL FOR UTILITY SYSTEMS

PART 1. GENERAL

1.1 SCOPE

- A. Furnish all labor, materials, equipment and incidentals necessary to perform all excavation, trenching and back fill required to complete the work shown on the Drawings and specified herein. The work shall include, but is not limited to; excavation for manholes, vaults, electrical manholes, hand holes, conduits, cables, raceways and ducts and pipes; all backfilling, embankment and grading; disposal of waste and surplus materials; and all related work such as sheeting, bracing and dewatering.
- B. Obtain materials required for backfill, fill, or embankments in excess of that available on the site from other sources. Include all costs of obtaining off-site materials in the contract price.

1.2 RELATED WORK

- A. Section 02530 – Wastewater Collection System

1.3 REFERENCES

- A. American Society for Testing and Materials.

1.4 TESTING SERVICES

- A. The Contractor shall obtain the service of a certified testing service to perform all compaction tests specified herein. The cost of these services shall be at Contractor's expense and shall be factored into his unit prices as outlined in the Bid Schedule.
- B. Soil testing shall be performed by an accredited testing laboratory selected by the Contractor and approved by the Owner in accordance with Section 01410. Tests shall be performed in accordance with applicable ASTM or AASHTO standard methods, unless otherwise specified.
- C. All materials to be used in the work shall be tested prior to the use to show conformance with the requirements of these specifications. Test reports shall be delivered to the Engineer in duplicate prior to use of any material in the work.
- D. Materials being used in the work, which have been tested previously, may be subjected to further tests from time to time and may be rejected if found defective. Rejected materials shall be removed from the project immediately, notwithstanding

the results of former tests to which they have been subjected.

- E. Soil tests shall be performed on sub-grades, as necessary, prior to the placement of fill or backfill materials. Tests shall also be performed immediately after the placement of each layer of fill or backfill materials to show conformance with the field density and optimum moisture requirements of these specifications. Not less than one set of tests shall be performed for every 800 sq. ft. of area for each layer. No additional layers shall be placed until the density of each layer has been approved.
- F. If the Engineer determines, based on tests reports and inspections, that sub-grades or layers which have been placed are below the specified density, the Contractor shall provide additional compaction and testing at no additional expense to the Owner.

1.5 PROTECTION

A. Sheeting and Bracing

1. Furnish, put in place, and maintain such sheeting and bracing as may be required to support the sides of excavations, to prevent any movement which could in any way diminish the ridge of the excavation below that necessary for proper construction, and to protect adjacent structures from undermining or other damage. If the Engineer is of the opinion that at any points sufficient or proper supports have not been provided, he may order additional supports put in at the expense of the Contractor, and compliance with such order shall not relieve or release the Contractor from his responsibility for the sufficiency of such supports. Care shall be taken to prevent voids outside of the sheeting, but if voids are formed, they shall be immediately filled and rammed. Where soil cannot be properly compacted to fill a void, lean concrete shall be used as backfill at no additional expense to the Owner. Sheeting and Bracing requirements are further defined in OSHA Standards, Subpart P, Part 1926 of the Code of Federal Regulations.
2. The Contractor shall construct the sheeting outside the neat lines of the foundation unless indicated otherwise to the extent he deems it desirable for his method of operation. Sheeting shall be plumb and securely braced and tied in position. Sheeting and bracing shall be adequate to withstand all pressures to which the trench will be subjected. Any movement or bulging which may occur shall be corrected by the Contractor at his own expense so as to provide the necessary clearances and dimensions.
3. Where sheeting and bracing is required to support the sides of excavations, the Contractor shall engage a Professional Engineer, registered in the State of South Carolina, to design the sheeting and bracing. The sheeting and bracing installed shall be in conformity with the design, and certification of

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EXCAVATION, TRENCHING, AND BACKFILL FOR UTILITY SYSTEMS

this shall be provided by the Professional Engineer.

4. The Contractor shall leave in place to be embedded in the backfill all sheeting and bracing not shown on the Drawings but which the Engineer may direct him in writing to leave in place at any time during the progress of the work for the purpose of preventing injury to structures, utilities, or property, whether public or private. The Engineer may direct that timber used for sheeting and bracing be cut off at any specified elevation.
5. All sheeting and bracing not left in place shall be carefully removed in such manner as not to disturb utilities, or property. All voids left or caused by withdrawal of sheeting shall be immediately refilled with sand by ramming with tools especially adapted to that purpose, or otherwise as acceptable to Engineer and Owner.
6. The right of the Engineer to order sheeting and bracing left in place shall not be construed as creating any obligation on his part to issue such orders, and his failure to exercise his right to do so shall not relieve the Contractor from liability for damages to persons or property occurring from or upon the work on the part of the Contractor to leave in place sufficient sheeting and bracing to prevent any caving or moving of the ground.
7. No sheeting is to be withdrawn if driven below mid-diameter of any pipe, and under no circumstances shall any sheeting be cut off at a level lower than 1 ft above the top of any pipe. The cost of said sheeting shall be part of the base bid.

B. Dewatering and Drainage

1. The Contractor shall at all times during construction provide and maintain proper equipment and facilities to remove all water entering excavations, and shall keep such excavations dry so as to obtain a satisfactory undisturbed sub-grade foundation condition until the fills, structures or pipes to be built thereon have been completed to such extent that they will not be floated or otherwise damaged by allowing water levels to return to natural levels. The Contractor shall engage a Geotechnical Engineer, Registered in the State of South Carolina where required, to design the dewatering system. The Contractor shall submit to the Engineer for review the design of the dewatering systems prior to commencing work.
2. The Contractor shall furnish, install, maintain, operate and remove a temporary dewatering system consisting of trenches, sump pits, deep wells, well points, or other methods as required to lower and control the groundwater level so that the pipes may be installed in the dry. The Contractor shall assume full responsibility for the design and installation of

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an adequate dewatering system. The Contractor shall, at his own expense, correct all damage resulting from inadequacy of the dewatering system or from flooding of the construction site from other causes.

3. The Contractor shall maintain the water level below the excavated area for the various phases of the work continuously and shall make such provisions as may be necessary to avoid interruptions due to weather, labor strikes, power failures, or other delays. He shall provide and have ready for immediate use at all times diesel or gasoline powered standby pumping units to serve the system in case of failure of the normal pumping units.
4. Piping and boiling, or any form of uncontrolled seepage, in the bottom or sides of the excavation shall be prevented at all times. If for any reason the dewatering system is found to be inadequate to meet the requirements set forth herein, the Contractor shall at his own expense make such additions, changes and/or replacements as necessary to provide a satisfactory dewatering system.
5. Dewatering shall at all times be conducted in such a manner as to preserve the undisturbed bearing capacity of the sub-grade soils at proposed bottom of excavation. Well or sump installations shall be constructed with proper sand filters to prevent drawing of finer grained soil from the surrounding ground.
6. Water entering the excavation from surface runoff shall be collected in shallow ditches around the perimeter of the excavation, drained to sumps, and pumped from the excavation to maintain a bottom free from standing water.
7. The Contractor shall take all additional precautions to prevent uplift during construction. The Contractor shall maintain the groundwater level below the pipe so flotation is prevented.
8. Drainage water shall be disposed of through a de-silting basin, as necessary, which will prevent the discharge of sediment into any surface waters or existing drains, and to prevent flow or seepage back into the excavated area.
9. Flotation shall be prevented by the Contractor by maintaining a positive and continuous operation of the dewatering system. The Contractor shall be fully responsible and liable for all damages which may result from failure of this system.
10. Removal of dewatering equipment shall be required; the material and equipment constituting the system, shall be removed by the Contractor.
11. The Contractor shall take all necessary precautions to preclude the accidental

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discharge of fuel, oil, etc. in order to prevent adverse effects on groundwater quality.

C. Culverts and Ditches

1. Protect drainage culverts from damage. If damaged, restore to satisfactory condition at no cost to the Owner.
2. If it is necessary to remove a culvert, do not replace until the proposed pipeline is installed and trench backfilled and compacted to the subgrade of the culvert. Replace culverts to the line and grade established by the Owner.
3. Backfill minor drainage ditches so that the upper one foot of material between ditch banks is topsoil, loam, or clay.
4. Compact this material for the full ditch width to a minimum of 95% of maximum density as determined by ASTM D 1557.
5. Ditches steeper than 2:1 slope shall be protected and reinforced with a synthetic fiber or grid material. Contractor has the option not to use reinforcement for slopes 2:1 or flatter. Correct any ditch erosion occurring as a result of pipeline construction at no cost to the Owner.

D. Water, Gas, Telephone, Power, Cable

1. Protect all other utilities from damage. Notify utility owner prior to start of excavation. If, during the work the utility is damaged, notify the utility company and the Owner immediately. Do not attempt to repair or replace damaged utilities unless so directed by the utility company and approved by the Engineer. Payment for restoration of damaged utilities shall be the Contractor's responsibility.

1.6 JOB CONDITIONS

A. Soils

1. The contractor shall examine the site and take soil borings, as necessary, prior to submitting his bid, taking into consideration all conditions that may affect his work. The Owner and Engineer will not assume responsibility for variations of subsoil quality or conditions. The Contractor shall accept the site in its existing condition, and shall assume the risk of encountering whatever materials as may occur. The Contractor shall make his own determination of the soil structure and site conditions as it may affect the work.

B. Existing Utilities

1. CALL BEFORE YOU DIG – At least (3) days prior to beginning any work, the Contractor shall request a field locate of existing underground utilities in the work area through State's Utility Protection service. If utilities are to remain in place, provide adequate means of protection during earthwork operations.
2. Should uncharted, or incorrectly charted, piping appear in the excavation, consult the Engineer and the Owner of such piping or utility immediately for directions.
3. Cooperate with Owner and utility companies in keeping respective services and facilities in operation. Repair damaged utilities to satisfaction of utility owner.
4. Demolish and completely remove from site existing underground utilities indicated on the Drawings to be removed.

C. Protection of Persons and Property

1. Barricade open excavations occurring as part of this work and post with warning lights. Operate warning lights as recommended by authorities having jurisdiction.
2. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout and other hazards created by earthwork operations.

1.7 SUBMITTALS

- A. Submit to the Engineer for review in accordance with Section 01300 the proposed methods of construction, including dewatering, excavation, filling, compaction, and backfilling for the various portions of the work. Review shall be for method only. The Contractor shall remain responsible for the adequacy and safety of the methods.

PART 2. PRODUCTS

2.1 MATERIALS

- A. Backfill materials shall be natural or processed mineral soils, blasted and crushed rock, or masonry rubble. Fill materials shall be free of all organic material, trash, snow, ice, frozen soil or other objectionable materials. Clay soils having a natural in-place water content in excess of 30 percent are considered unsuitable for stockpiling and/or future use. Fill materials to be used have been classified under

categories specified below.

- B. Embedment materials listed here include a number of processed materials plus the soil types defined by the USCS Soil Classification Systems in ASTM D2487. These materials are grouped into categories according to their suitability for this application:
1. Class I: Angular 6 to 40 mm (1/4 to 1-1/2 inches), graded stone including a number of fill materials that have regional significance such as coral, slag, cinders, crushed stone, and crushed shells.
 2. Class II: Coarse sands and gravels with maximum particle size of 40 mm (1-1/2 inches), including variously graded sands and gravels containing small percentages of fines, generally granular and non-cohesive, either wet or dry. Soil types GW, GP, SW and SP are included in this class.
 3. Class III: Fine sand and clayey gravels, including fine sands, sand-clay mixtures, and gravel-clay mixtures. Soil types GM, GC, SM and SC are included in this class.
 4. Class IV: Silt, silty clays and clays including inorganic clays and silts of medium to high plasticity and liquid limits. Soil types MH, CH and CL are included in this class. These materials are not to be used for bedding, haunching or initial backfill.
 5. Class V: This class includes the organic soils OL, OH and PT as well as soils containing frozen earth, debris, rocks larger than 40 mm (1-1/2 inches) in diameter, and other foreign materials. These materials shall not be used for bedding, haunching and initial backfill.
- C. Sand shall conform to ASTM Standard C33 for concrete sand.

PART 3. EXECUTION

3.1 EXCAVATION

- A. It is the responsibility of those performing excavation and trenching to conform to all State and Federal Laws and Regulations, and local ordinances relation to safety life, health and property including but not limited to OSHA regulations, 29 CFR PART 1926, Subpart P, Paragraph 1926.650 through 1926.652 during all excavations and trenching. All excavations shall be adequately guarded with barricades and light in compliance with all OSHA and Department of Transportation requirements so as to protect the public from hazard. Excavations adjacent to existing or proposed buildings and structures or in paved streets or alleys

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shall be sheeted, shored and braced adequately to prevent undermining or subsequent settlement of such structures or pavements. Underpinning of adjacent structures shall be done when necessary to maintain structures in safe condition.

- B. The Contractor shall proceed with caution in the excavation and preparation of the trench so that the exact location of underground structures in the trench zone may be determined before being damaged. He shall be held responsible for the repair or replacement of such structures when broken or otherwise damaged because of his operations.
- C. The Contractor shall make explorations and excavations at no additional charge to the Owner to determine the location of existing underground structures.
- D. Utilities and other piping shall be laid in open trenches as shown and specified. Trenches shall be excavated to the designated lines and grades, beginning at the outlet end and progressing toward the upper end in each case. Trenches for pipe shall be shaped to the lower 1/3 of the pipe and provide uniform and continuous bearing. Bell holes shall be dug to allow ample room for working fully around each joint.
- E. Trenches shall be of minimum width to provide ample working space for making joints and shall be not less than 8 inches or more than 12 inches. Sides of trenches shall be closely vertical to top of pipe and shall be sheet piled and braced where soil is unstable nature. Above the top of the pipe, trenches may be sloped. The ridge of the trench above this level may be wider for sheeting and bracing and the performance of the work.
- F. Trenches shall be excavated on the alignments shown on the Plans, and to the depth and grade necessary to accommodate the pipes at the elevations shown. Where elevations of the invert or centerline of a pipe are shown at the ends of a pipe, the pipe shall be installed at a continuous grade between the two elevations.
- G. Excavation in excess of the depth required for proper shaping shall be corrected by bringing to grade the invert of the ditch with compacted coarse, granular material at no additional expense to the Owner. Bell holes shall be excavated to relieve bell of all load, but small enough to insure that support is provided throughout the length of the pipe barrel.
- H. Excavation in excess of the depths required for manholes and other structures shall be corrected by placing a sub-foundation of 1500 psi concrete, at no additional expense of the Owner.
- I. If trenches are excavated to widths in excess of those specified, or if the trench walls collapse, the pipe shall be laid in accordance with the next better class of bedding at the expense of the Contractor.

3.2 TRENCHES

- A. Trenches shall be maintained in a safe condition to prevent hazardous conditions to persons working in or around the trench.
- B. Braced and sheeted trenches and open trenches shall comply with all State and Federal Laws and Regulations, and local ordinances relating to safety, life, health and property.
- C. The top portion of the trench may be excavated with sloping or vertical sides to any width which will not cause damage to adjoining structures, roadways, utilities, etc. The bottom of the trenches shall be graded to provide uniform bearing and support each section of the pipe on undisturbed soil every point along its entire length, except for the portions of the pipe sections excavated for bell holes and for the sealing of pipe joints. Bell holes and depressions for joints shall be dug after the trench bottom has been graded and in order that the pipe rests upon the trench bottom for its full length and shall be only of such length, depth and width for making the particular type of joints. The bottom of the trench shall be rounded so that at least the bottom one-third of the pipe shall rest on undisturbed earth for the full length of the barrel as jointing operations will permit. This part of the excavation shall be done manually only a few feet in advance of the pipe laying by workmen skilled in this type of work.
- D. The sides of all trenches and excavation for structures shall be held by stay bracing, or by skeleton or solid sheeting and bracing according to conditions encountered, to protect the excavation, adjoining property and for the safety of personnel. Bracing and shoring may be removed when the level of the backfilling has reached the elevation to protect the pipe work and adjacent property. When sheeting or shoring above this level cannot be safely removed, it may be left in place. Timber left in place shall be cut off at least 2 feet below the surface. No sheeting below the level of the top of the pipe may be removed.
- E. Trenches shall be kept free of water. No structure shall be built or pipe shall be laid in water, and water shall not be allowed to flow over or rise upon any concrete, masonry or pipe until the same has been inspected and the concrete or joint materials has thoroughly set. All water pumped, bailed or otherwise removed from the trench or other excavation shall be conveyed in a proper manner to a suitable place of discharge where it will not cause injury to the public health or to public or private property or to work completed or in progress, or to the surface of the streets or cause any interference with the use of same by the public.

3.3 PILING EXCAVATED MATERIALS

- A. All excavated material shall be piled in a manner that will not endanger the work and that will avoid obstructing roadways.

3.4 LIMIT TO LENGTH OF OPEN TRENCH

- A. Pipe trenches shall not be excavated more than 400 feet in advance of pipe laying and all work shall be performed to cause the least possible inconvenience to the public. Adequate temporary bridges or crossings shall be constructed and maintained where required to permit uninterrupted vehicular and pedestrian traffic.

3.5 REMOVAL OF UNSUITABLE MATERIAL

- A. Should over depth excavation be necessary to remove unsuitable material and to replace with satisfactory material. The Contractor will be paid for this work based on the following requirements:
1. When the trench is excavated to the plan depth or as required by these Specifications, and soft or other material not suitable for bedding purposes is encountered in the trench, the Contractor shall immediately notify the Engineer for inspection and measurement of the unsuitable material to be removed.
 2. No over depth excavation or backfilling of the over depth excavated trench shall start until proper measurements of the trench have been taken by the Engineer for the determination of the quantity in cubic yards of unsuitable material excavated.
 3. No payment will be made for any over depth excavation of soft unstable material due to the failure of the Contractor to provide adequate means to keep the trench dry.
 4. No payment will be made for any over depth excavation of the unsuitable material and replacement not inspected and measured by the Engineer prior to excavation.

3.6 BEDDING AND HAUNCHING OF GRAVITY SEWER PIPE

- A. Bedding for PVC gravity sewer pipe shall be in accordance with ASTM D 2321, as amended to date, the manufacturer's recommendations and these specifications. All gravity sewer pipes (including service lines) shall have a minimum Type 5 bedding for PVC pipe and Type 4 for ductile iron pipe, but where designated in the Drawings and Specifications, Type 2, or 3 may be required. Type 1 embedment is not permitted without approval of the Engineer. Bedding material shall be included in the unit price bid for the work in which it pertains.

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1. Type 1 - Flat Bottom Trench. Flat bottom trench on undisturbed earth with excavation for Bells. General backfill shall be as specified in Paragraph 3.08 Backfilling.
 2. Type 2 - Flat Bottom Trench. Flat Bottom Trench on undisturbed earth with excavation for Bells. Select backfill shall be placed and lightly tamped to the top of the pipe. Select and General backfill shall be as specified in Paragraph 3.08 Backfilling.
 3. Type 3 - Loose Soil Bedding. Pipe bedded in 4- in. minimum Select Material. Select backfill shall be placed and lightly consolidated to a level of 6-inches minimum over the top of the pipe. Select and general Backfill shall be as specified in paragraph 3.08 Backfilling.
 4. Type 4 - Granular Bedding. Pipe bedded in granular material to a depth of 1/8 outside pipe diameter or 6-inch minimum granular material, whichever is greater, on a flat trench bottom. The bedding material shall be placed under the haunches of the pipe with a shovel or other suitable tool to a height of 1/4 outside pipe diameter of the pipe. The initial select backfill shall be hand placed to a level of 12-inches minimum over the top of the pipe and shall consist of finely divided select materials free from debris, organic material and large rocks and stones. It shall be placed and tamped in layers not over 6-inches thick to at least 90% Standard Proctor, AASHTO T-99 (95% under road crossings).
 5. Type 5 - Granular Bedding. Pipe bedded in to a depth of 1/8 outside pipe diameter or 6-inch minimum granular material, whichever is greater, on a flat trench bottom. The bedding material shall be placed under the haunches of the pipe with a shovel or other suitable tool to a height of 1/2 outside pipe diameter of the pipe. The initial select backfill shall be hand placed to a level of 12-inches minimum over the top of the pipe and shall consist of finely divided select materials free from debris, organic material and large rocks and stones. It shall be placed and tamped in layers not over 6-inches thick to at least 95% Standard Proctor, AASHTO T-99.
- B. Class I materials shall be used for bedding and haunching for both PVC and DI pipe as shown on the Drawings. Class II,III, IV, and V materials will not be permitted for bedding and haunching under any conditions. Embedment material around the pipe shall be installed with care to insure that sufficient material has been worked under the haunch of the pipe to provide adequate side support. Precautions must be taken to prevent movement of the pipe while placing the bedding and backfill material.

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- C. Bell holes shall be provided in all classes of bedding to relieve pipe bells of all loads, but small enough to insure that support is provided throughout the length of the pipe barrel.
- D. Avoid contact between the pipe and compaction equipment. Compaction of haunching, initial backfill and general backfill material shall be done in such a way so that compaction equipment will not have a damaging effect on the pipe.
- E. If the trench is excavated in excess of those dimensions detailed on the Drawings or to depths greater than shown on the Drawings, or if the trench walls collapse, pipe shall be laid in accordance with the requirements for at least the next better class of bedding or as directed by the Engineer at the expense of the Contractor.
- F. The trench depth shall be as shown on the Plans. If a trench depth is not shown, then the trench depth shall be the minimum depth of cover as required by the pipe manufacturer.

3.7 BEDDING OF PRESSURE PIPE

NOT USED

3.8 BACKFILLING

- A. Backfilling consists of placing suitable materials removed during the excavation into the excavated areas, placing embedment materials and compacting the same to a density equal to or greater than what exists before excavation or as specified herein.
- B. Under backfilling information is also included removal of excess materials and debris from the site, leveling all depressions caused by operation of equipment and maintaining the backfilled areas until accepted by the Owner.
- C. All backfill material shall be free of stones, concrete and clay lumps larger than 1/3 cubic foot. Roots, stumps and rubbish which will decompose will not be permitted in the backfill. Backfill material shall have its moisture content corrected, as may be necessary before being placed in the trench to bring the moisture content to approximately "optimum" for good compaction. Any rock, stone, concrete, clay lumps larger than 1/3 cubic foot in volume, rubbish and debris shall be removed from the site and disposed of by the Contractor in a lawful manner.
- D. Backfilling operations in this work are referred to herein as Backfilling at the Pipe Zone, Type "A" and Type "B".
- E. Backfilling in the excavated areas below parts of proposed structures shall be referred to hereinafter as Type "A" Backfilling.

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- F. Where trenches cross or extend under structures or into present roadways, future roadways or parking areas as shown on the Plans, the backfilling shall be referred to hereinafter as Type "B" Backfilling.
- G. Backfilling at the Pipe Zone: Throughout the entire construction, backfilling at the pipe zone shall include bedding and shall be as follows: Backfill material shall be placed below, around each side, and over the top of the pipe, in approximately horizontal layers to a height of 12 inches over the top of the pipe. Layers shall be of such thickness to facilitate the required compaction. This backfill shall be well compacted by using mechanical tamping equipment in such manner as not to damage the pipe, pipe joints or shift the pipe alignment. Workmen shall not be permitted to walk over the pipe until at least 12 inches of compacted fill has been placed over the pipe. The Contractor shall not use water to obtain compaction except for adding water to the backfill material before placing in the trench to bring the moisture content to approximately "optimum" for good compaction.
- H. Type "A" Backfilling: Type "A" backfilling consists of placing sand and gravel or other suitable materials excavated from the trench in the trench in 6 inch thick layers from a point 12 inches above the top of the pipe and mechanically tamped or compacted by rolling until the backfill density after compaction is equal to 98 percent of the maximum density obtainable at optimum moisture content as determined by the Standard proctor Test (ASTM D698). No water shall be used to secure compaction except for adding water to the backfill material before placing in the trench to bring moisture content approximately "optimum" for good compaction. Each 6 inch thick layer shall be mechanically tamped before additional backfill material is placed in the excavated area.
- I. Type "B" Backfilling: Type "B" Backfilling consists of placing sand and gravel or other suitable material excavated from the trench in the trench in 12 inch thick compacted layers from a point 12 inches above the top of the pipe. Each 12 inch thick layer shall be compacted before additional backfill material placed in the excavation. Only mechanical tamping, use of roller or small tractor will be allowed. the density of the backfilled material after compaction shall be equal to 95 percent of the maximum density obtainable at optimum moisture content as determined by the Standard Proctor Test (ASTM D698). Except in the upper 12 inches, water shall be added to backfill material only before being placed in the trench in order to bring the moisture content to approximately "optimum" for good compaction.

3.9 PROTECTION OF WATER SUPPLY PIPES

- A. Horizontal Separation: Sewers and force mains shall be laid at least 10 feet horizontally from any existing or proposed watermain. The distance shall be measured edge to edge. In cases where it is not practical to maintain a 10 foot separation, such deviation may allow installation of the sewer or force main closer to the watermain, provided that the watermain is in a separate trench or on a undisturbed earth shelf located on the side of the sewer or force main and at an

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elevation so the bottom of the watermain is at least 18 inches above the top of the sewer or force main.

- B. Crossings: Sewers and force mains crossing water mains shall be laid to provide a minimum vertical distance of 18 inches between the outside of the watermain and the outside of the sewer or force main. This shall be the case where the watermain is either above or below the sewer or force main. The crossing shall be arranged so that the sewer or force main joints will be equidistant and as far as possible from the watermain joints. Where a watermain crosses under a sewer or force main, adequate structural support shall be provided for the sewer or force main to prevent damage to the watermain.
- C. Special Conditions: When it is impossible to obtain proper horizontal and vertical separation as stipulated above, the sewer or force main shall be designed and constructed equal to water pipe, and shall be pressure tested to assure water tightness prior to backfilling.

3.10 UTILITY CONSTRUCTION IN OTHER EXCAVATION

- A. Where utilities are required to be constructed in areas also requiring excavation and backfill for other work, coordinate the work so that the parts come together properly and the construction of the various parts can be done without damage to other parts. Place bedding which will form bearing for pipes, using suitable material and shaping to the lower 1/3 of the pipe to provide uniform and continuous bearing. Compaction of backfill material which will form bearing shall be equal to that specified hereinbefore under Type "A" Backfilling. After the pipe or other utility is placed, backfilling shall proceed as specified hereinbefore following the requirements specified under "Backfilling at the Pipe Zone," "Type 'A' Backfilling", and "Type 'B' Backfilling" as applicable.

3.11 TESTING

- A. General: The Contractor shall select a qualified independent testing laboratory for the purpose of identifying soils, checking densities, and classifying soils materials during construction. All testing will be paid for by the Contractor. Copies of all test results shall be furnished to the Engineer in duplicate.
- B. Moisture-Density Tests: Testing shall be in accordance with ASTM Methods D698 and D1557. A test shall be performed on each type of material used in the work regardless of source. Tests will be accompanied by particle-size analyses of the soils tested (ASTM Methods D421 and D422). Changes in color, gradation, plasticity or source of fill material will require the performance of additional tests. Copies of all test results shall be furnished to the Engineer.
- C. Field Density Tests: Tests shall be made in accordance with ASTM Method D1556.

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Tests shall be made in accordance with the following minimum schedule or as required by the soils technician or as may be directed by the Engineer:

1. One test for each lift of backfill for each 200 feet of trench or fraction thereof.

D. Submittals

NOT USED

E. Compaction Results

1. If any compaction tests reveal that fill or backfill is not compacted as specified, the Contractor shall scarify and re-compact as required to achieve the specified density. Additional compaction tests shall be made to verify proper compaction. These additional tests, required due to failure of the original test shall be paid for by the Contractor without reimbursement by the Owner.
2. The soils technician is to advise the Engineer and the Contractor's Superintendent immediately of any compaction tests failing to meet the specified minimum requirements. No additional lift is to be placed on a lift with any portion failing.

3.12 CONSTRUCTION ALONG HIGHWAYS, STREETS AND ROADWAYS

- A. Excavation, Trenching and Backfilling Operations: Excavation, trenching and backfilling along highways, streets and roadways shall be in accordance with the applicable regulations of the State Department of Transportation with reference to construction operations, safety, traffic control, road maintenance and repair.
- B. Protection of Traffic: Provide suitable signs, barricades and lights for protection of traffic, in locations where traffic may be endangered by construction operations. All signs removed by reason of construction shall be replaced as soon as condition which necessitated such removal has been cleared. No highway, street or roadway shall be closed without first obtaining permission from the proper authorities.
- C. Construction Operations: The Contractor shall construct all work along highways, streets and roadways using the following sequence of construction operations, so as to least interfere with traffic:
 1. Stripping: Where the pipe line is laid along road shoulders, sod, topsoil and other material suitable for shoulder restoration shall be stripped and stockpiled for replacement.

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2. Trenching, Laying and Backfilling: Excavate trenches, install pipe line and backfill. The trench shall not be opened any further ahead of pipe laying operations than is necessary for proper laying operations. Trenches shall be progressively backfilled and consolidated and excess material removed immediately.
 3. Shaping: Immediately after completing backfilling operation, reshape any damage to cut and fill slopes, side ditch lines, and shall replace top soil, sod and any other materials removed from shoulders.
- D. Excavated Material: Excavated material shall not be placed along highways, streets, and roadways in such manner as to obstruct traffic. Roadways and pavement will be maintained free of earth material and debris.
- E. Drainage Structures: All side ditches, culverts, cross drains and other drainage structures shall be kept clear of excavated material and be free to drain at all times.
- F. Maintaining Highways, Streets, Roadways and Driveways
1. The Contractor shall furnish a road grader which shall be available for use at all times for maintaining highways, streets and roadways. All such streets, highways and roadways shall be maintained in suitable condition until completion and final acceptance of the work.
 2. Repair all driveways that are cut or damaged. Maintain them in suitable condition until completion and final acceptance of the work.

3.13 REMOVING AND RESETTING FENCES

NOT USED

3.14 PROTECTING TREES, SHRUBBERY AND LAWNS

- A. Trees and shrubbery along trench lines shall not be disturbed unless absolutely necessary. Trees and shrubbery necessary to be removed shall be properly heeled-in and re-planted. Heeling-in and re-planting shall be done under the direction of an experienced nurseryman.
- B. Where utility trenches cross established lawns, sod shall be cut, removed, stacked and maintained in suitable condition until replaced. Topsoil underlying lawn areas shall likewise be removed and kept separate from general excavated materials. Removal and replacement of sod shall be done under the direction of an experienced nurseryman.

3.15 REMOVE AND REPLACE PAVEMENT

- A. Pavement and base course which must be removed for constructing sewers, manholes, forcemains, water lines, and all other appurtenances in streets shall be replaced as specified in Section 02741SC.
 - 1. The top 18 inches of subgrade material immediately under the paving base and also road shoulder shall be carefully removed and kept separate from the rest of the excavated material. This material shall be placed in the top 18 inches of the backfill. Further compaction shall be accomplished by leaving the backfilled trench open to traffic while maintaining the surface with crushed stone or gravel. Settlement in trenches shall be refilled with crushed stone or gravel, and such maintenance shall continue until replacement of pavement.
 - 2. Where utility lines are constructed on unpaved streets, roads or easements, the top 18 inches of soil shall be stripped and windrowed separate from the excavation from trenches. After the line has been installed and the backfill completed within 18 inches of the original grade, the salvaged surfacing shall be replaced. This work shall be considered as general clean up along with the removal of surplus excavated materials from the site and the restoring of the surface outside trench limits to its original condition, the cost of which shall be included in the price bid for the utility line.

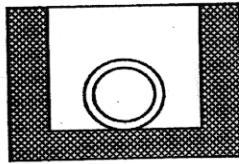
3.16 WALKS, DRIVES, CONCRETE CURB AND GUTTER

- A. Walks and drives removed or damaged during the course of construction shall be replaced with Class "A" Concrete at the same thickness as removed. They will be cut to a neat edge with a masonry saw after backfilling and compacting trench in 6 inch layers to a density not less than 98 percent at + 2 percent of optimum moisture content as determined by the Standard Proctor Test.
- B. Concrete curb and gutter sections removed or damaged during the course of construction shall be replaced in full sections with concrete having a compressive strength of at least 3,000 psi.

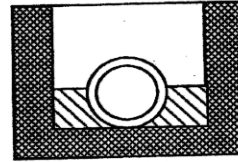
3.17 MEASUREMENT AND PAYMENT

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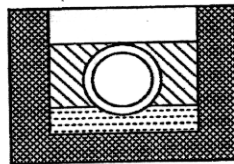
UNDERGROUND INSTALLATION OF PVC PIPE 7



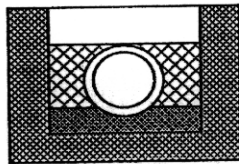
Type 1
Flat-bottom trench.* Loose embedment.
 $E = 50$ psi (340 kPa), $K = 0.110$



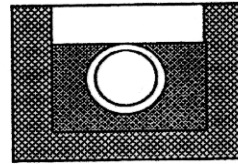
Type 2
Flat-bottom trench.* Embedment lightly consolidated to centerline of pipe.
 $E = 200$ psi (1,380 kPa), $K = 0.110$



Type 3
Pipe bedded on 4 in. (100 mm) minimum of loose soil.† Embedment lightly consolidated to top of pipe.
 $E = 400$ psi (2,760 kPa), $K = 0.102$



Type 4
Pipe bedded on sand, gravel, or crushed stone to depth of $\frac{1}{6}$ pipe diameter, 4 in. (100 mm) minimum. Embedment compacted to top of pipe. (Approximately 80 percent Standard Proctor, AASHTO T-99 or ASTM D 698.)
 $E = 1,000$ psi (6,900 kPa), $K = 0.096$



Type 5
Pipe embedded in compacted granular material to centerline of pipe. Compacted granular or select material† to top of pipe. (Approximately 90 percent Standard Proctor, AASHTO T-99 or ASTM D 698.)
 $E = 2,000$ psi (13,800 kPa), $K = 0.083$

NOTE: Required embedment type will depend on the pipe's dimension ratio, internal operating pressure, and external load, and shall be specified by the purchaser. (See Sec. 5.3)

*"Flat-bottom" is defined as undisturbed earth.

†"Loose soil" or "select material" is defined as native soil excavated from the trench, free of rocks, foreign materials, and frozen earth. A soft "loose soil" bedding will contour to the pipe bottom. Caution must be exercised to ensure proper placement of embedment material under the haunches of the pipe.

Figure 1 Typical embedment types

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END OF SECTION

**SECTION 02401
HORIZONTAL DIRECTIONAL DRILLING (HDD)
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**SECTION 02401-HDD
HORIZONTAL DIRECTIONAL DRILLING (HDD)**

PART 1. SCOPE

1.1 GENERAL

- A. It is the intent of this specification to define the acceptable methods and materials for installing sanitary sewer force mains by the horizontal directional drilling method.

1.2 INSTALLATION PLAN

- A. At least 7 days prior to mobilizing equipment Contractor shall submit his detailed installation plan to the Engineer. The plan shall include a detailed plan and profile of the bores and be plotted at a scale no smaller than 1 inch equals 20 feet horizontal and vertical.
- B. The plan shall also include a listing of major equipment and supervisory personnel and a description of the methods to be used.

1.3 VARIATIONS IN PLAN OR PROFILE

- A. The Contractor may request changes to the proposed vertical and horizontal alignment of the installation and the location of the entry and exit points. Proposed changes shall be submitted in writing to the Engineer and receive approval of the Engineer prior to construction.

1.4 ALIGNMENT

- A. The proposed plan and profile installation locations are based on alignments to accommodate acquired easements, to avoid obstructions, and to properly maintain operation flow velocities.

1.5 QUALIFICATIONS

- A. Directional drilling and pipe installation shall be done only by an experienced Contractor specializing in directional drilling and whose key personnel have at least five (5) years experience in this work. Furthermore, the Contractor shall have installed directionally drilled pipe at least as large as 20 inches in diameter, have performed crossings at least 2,000 feet in length, and successfully installed at least 100,000 feet in length.

PART 2. MATERIALS

2.1 PROCEDURES

A. General:

All pipe shall be cut, fabricated, and installed in strict conformance with the pipe manufacturer's recommendations. Joining, laying, and pulling of pipe shall be accomplished by experienced personnel. The pipe supplier shall certify in writing that the Contractor is qualified to join, lay, and pull the pipe or representative of the pipe manufacturer shall be on site to oversee the pipe joining. Expense for the representative shall be paid for by the Contractor.

B. Transportation:

Care shall be taken during transportation of the pipe to ensure that it is not cut, kinked, or otherwise damaged.

C. Storage:

Pipes shall be stored on level ground, preferably turf or sand, free of sharp objects which could damage the pipe. Stacking of the polyethylene pipe shall be limited to a height that will not cause excessive deformation of the bottom layers of pipes under anticipated temperature condition. Where necessary due to ground conditions, the pipe shall be stored on wooden sleepers, spaced suitably and of such widths as not to allow deformation of the pipe at the point of contact with the sleeper or between supports.

D. Handling Pipe:

The handling of the joined pipeline shall be in such a manner that the pipe is not damaged by dragging it over sharp and cutting objects. Ropes, fabric, or rubber-protected slings and straps shall be used when handling pipes. Chains, cables, or hooks inserted into the pipe ends shall NOT be used. Two slings spread apart shall be used for lifting each length of pipe. Pipe or fittings shall not be dropped onto rocky or unprepared ground. Slings for handling the pipeline shall not be positioned at butt-fused joints. Sections of the pipes with cuts and gouges exceeding 10 percent of the pipe wall thickness or kinked sections shall be removed and the ends rejoined.

The open ends of all sections of joined and/or installed pipe (not in service) shall be plugged at night to prevent animals or foreign material from entering the pipe line or pipe section.

Waterproof nightcaps of approved design may be used but they shall also be so constructed that they will prevent the entrance of any type of natural precipitation into the pipe and will be fastened to the pipe in such a manner that the wind cannot blow them loose.

The practice of stuffing cloth or paper in the open ends of the pipe will be considered unacceptable.

Where possible, the pipe shall be raised and supported at a suitable distance back from the open end such that the open end will be below the level of the pipe at the point of support.

PART 3. INSTALLATION

3.1 GENERAL

- A. The Contractor shall install the pipelines by means of horizontal directional drilling. The Contractor shall assemble, support, and pretest the pipeline prior to installation in the directional drill tunnel.
- B. Horizontal directional drilling shall consist of the drilling of a small diameter pilot hole from one end of the alignment to the other, followed by enlarging the hole diameter for the pipeline insertion. The exact method and techniques for completing the directionally drilled installation will be determined by the Contractor, subject to the requirements of these specifications.
- C. The Contractor shall prepare and submit a plan to the Engineer. This plan shall include pullback procedure, ballasting, use of rollers, side booms and side rollers, coating protection, internal cleaning, internal gauging, hydrostatic test, dewatering and purging.
- D. The required piping shall be assembled in a manner that does not obstruct adjacent roadways or public activities. The Contractor shall erect temporary fencing around the entry and exit pipe staging areas.

3.2 TESTING

- A. The pipe shall be hydrostatically tested after joining into continuous lengths prior to installation and again after installation. Pressure and temperature shall be monitored with certified instruments during the test. After this test, the water will be removed with pigs. Erosion prevention procedures will be used during removal and discharge of the water.
- B. Hydrostatic testing shall be performed in accordance with the Owner/Engineers Standard Specifications. All costs associated with acquiring water for testing shall be included in the established contract unit bid prices.

3.3 TOLERANCES

- A. Pipe installed by the directional drilled method must be located in plan as shown on

the Drawings, and must be no shallower that shown on the Drawing unless otherwise approved. The Contractor shall plot the actual horizontal and vertical alignment of the pilot bore at intervals not exceeding 30 feet. This “as-built” plan and profile shall be updated as the pilot bore is advanced. The Contractor shall at all times provide and maintain instrumentation that will accurately locate the pilot hole and measure drilling fluid flow and pressure. The Contractor shall grant the Engineer access to all data and readout pertaining to the position of the bore head and the fluid pressures and flows. When requested, the Contractor shall provide explanations of this position monitoring and steering equipment. The Contractor shall employ experienced personnel to operate the directional drilling equipment and, in particular, the position monitoring and steering equipment. No information of the pilot bores shall be withheld from the Engineer.

- B. Each exit point shall be located as shown with an over-length tolerance of 10 feet for directional drills of 1,000 linear feet or less and 40 feet for directional drills of greater than 1,000 linear feet and an alignment tolerance of 5 feet left/right with due consideration of the position of the other exit points and the required permanent easement. The alignment of each pilot bore must be approved by the Engineer before pipe can be pulled. If the pilot bore fails to conform to the above tolerances, the Engineer may, at his option, require a new pilot boring to be made.
- C. After the pipe is in place, cleaning pigs shall be used to remove residual water and debris. After the cleaning operation, the Contractor shall provide and run a sizing pig to check for anomalies in the form of buckles, dents, excessive out-of-roundness, and any other deformations. The sizing pig run shall be considered acceptable if the survey results indicate that there are no sharp anomalies (e.g. dents, buckles, gouges, and internal obstructions) greater that 2 percent of the nominal pipe diameter, or excessive ovality greater than 5 percent of the nominal pipe diameter. For gauging purposes, dent locations are those defined above which occur within a span of five feet or less. Pipe ovality shall be measured as the percent difference between the maximum and minimum pipe diameters. For gauging purpose, ovality locations are those defined above which exceed a span of five feet.

3.4 REAM AND PULLBACK

- A. Reaming: Reaming operations shall be conducted to enlarge the pilot after acceptance of the pilot bore. The number and size of such reaming operations shall be conducted at the discretion of the Contractor.
- B. Pulling Loads: The maximum allowable pull exerted on pipelines shall be measured continuously and limited to the maximum allowed by the pipe manufacturer so that the pipe or joints are not over stressed.
- C. Torsion and Stresses: A swivel shall be used to connect the pipeline to the drill pipe to prevent torsional stresses from occurring in the pipe.

- D. The lead end of the pipe shall be closed during the pullback operation.
- E. Pipeline Support: The pipelines shall be adequately supported by rollers and side booms and monitored during installation so as to prevent over stressing or buckling during the pullback operation. Such support/rollers shall be spaced at a maximum of 60 feet on centers, and the rollers to be comprised of a non-abrasive material arranged in a manner to provide support to the bottom and bottom quarter points of the pipeline allowing for free movement of the pipeline during pullback. Surface damage shall be repaired by the Contractor before pulling operations resume.
- F. The contractor shall at all times handle the pipe in a manner that does not over stress the pipe. Vertical and horizontal curves shall be limited so that wall stresses do not exceed 50% of yield stress for flexural bending of the pipe. If the pipe is buckled or otherwise damaged, the damaged section shall be removed and replaced by the Contractor at his expense. The Contractor shall take appropriate steps during pullback to ensure that the pipe will be installed without damage.

3.5 HANDLING DRILLING FLUIDS AND CUTTINGS

- A. During the drilling, reaming, or pullback operations, the Contractor shall make adequate provisions for handling the drilling fluids, or cutting at the entry and exit pits. To the greatest extent practical, these fluids must not be discharged into any waterway or surface water conveyance ditch or structure. When the Contractor's provisions for storage of the fluids or cuttings on site are exceeded, these materials shall be hauled away to a suitable legal disposal site. The Contractor shall conduct his directional drilling operation in such a manner that drilling fluids are not forced through the bore sub-bottom into the groundwater or associated waterway. After completion of the directional drilling work, the entry and exit pit locations shall be restored to original conditions. The Contractor shall comply with all permit provisions.
- B. Pits constructed at the entry or exit point area shall be so constructed to completely contain the drill fluid and prevent its escape to groundwater or surface water.
- C. The Contractor shall utilize drilling tools and procedures which will minimize the discharge of any drill fluids. The Contractor shall comply with all mitigation measures listed in the required permits and elsewhere in these Specifications.
- D. To the extent practical, the Contractor shall maintain a closed loop drilling fluid system.
- E. The Contractor shall minimize drilling fluid disposal quantities by utilizing a drilling fluid cleaning system which allows the returned fluids to be reused.

- F. As part of the installation plan, specified herein before, the Contractor shall submit a drilling fluid plan which details types of drilling fluids, cleaning and recycling equipment, estimated flow rates, and procedures for minimizing drilling fluid escape.

PART 4. DRILLING OPERATIONS

4.1 GENERAL

The Contractor shall prepare a plan to be submitted for Engineer approval which describes the noise reduction program, solids and liquid control plant, pilot hole drilling procedure, the reaming operation, and the pullback procedure. All drilling operations shall be performed by supervisors and personnel experienced in horizontal directional drilling. All required support, including drilling tool suppliers, survey systems, mud cleaning, mud disposal, and other required support systems used during this operation shall be provided by the Contractor.

Drill pipe shall be API steel drill pipe, Range 2, Premium Class or higher, Grade S-135 in a diameter sufficient for the torque and longitudinal loads and fluid capacities required for the work. Only drill pipe inspected under API's Recommended Practice Specification API RP 7G within 30 days prior to start and certified as double white band or better shall be used.

A smoothly drilled pilot hole shall follow the design centerline of the pipe profile and alignment described on the construction drawings.

The position of the drill string shall be continuously monitored by the Contractor with the down hole survey instruments. The line and grade of the pipe shall be maintained to within 5 feet of proposed line and 0.5 feet of proposed grade. A magnetic guidance system shall continually monitor down hole probe location. A Surface locating system shall be established to provide a backup and independent determination of pipeline location. System to be comparable to "TruTracker" or equivalent.

Deviations from the acceptable tolerances described in the Specifications shall be documented and immediately brought to the attention of the Engineer for discussion and/or approval. The profile and alignment defined on the construction drawings for the bores define the minimum depth and radius of curvature. At no point in the drilled profile shall the radius of curvature of the bore be less than 1,600 feet. The Contractor shall maintain and provide to the Engineer, upon request, the data generated by the down hole survey tools in a form suitable for independent calculation of the pilot hole profile.

During the entire operation, waste and leftover drilling fluids from the pits and cuttings shall be dewatered and disposed of in accordance with all permits and regulatory agencies requirements.

Technical criteria for bentonite shall be given in API Spec. 13A, Specification for Oil Well Drilling Fluids Material for fresh water drilling fluids. Any modification to the basic drilling fluid involving additives must describe the type of material to be used and be included in Contractor's drilling plan presented to the Engineer. The Owner retains the right to sample and monitor the waste drilling mud, cuttings and water.

4.2 ENVIRONMENTAL PROVISIONS

The Horizontal Directional Drilling operation is to be operated in a manner to eliminate the discharge of water, drilling mud and cuttings to any adjacent surface water or land areas involved during the construction process. The Contractor shall provide equipment and procedures to maximize the recirculation or reuse of drilling mud to minimize waste. All excavated pits used in the drilling operation shall be lined by Contractor with heavy duty plastic sheeting with sealed joints to prevent the migration of drilling fluids and/or ground water.

The Contractor shall visit the site and must be aware of all structures and site limitations at the directional drill crossing and provide the Engineer with a drilling plan outlining procedures to prevent drilling fluid from adversely affecting the surrounding area.

Waste cuttings and drilling mud shall be processed as necessary to comply with all environmental regulation. The cuttings and excess drilling fluids shall be dewatered and dried by the Contractor to the extent necessary for disposal at offsite landfill. Water from the dewatering process shall be treated by the Contractor to meet permit requirements and disposed of locally. The cuttings and water for disposal are subject to being sampled and tested. The construction site and adjacent areas will be checked frequently for signs of leaks or seeps.

Equipment (grader, shovels, etc.) and materials (such as groundsheets, hay bales, booms and absorbent pads) for cleanup and contingencies shall be provided in sufficient quantities by the Contractor and maintained at all sites for use in the event of inadvertent leaks, seeps or spills.

Waste drilling mud and cuttings shall be dewatered, dried, and stock piled such that it can be loaded by a front end loader, transferred to a truck and hauled offsite to a suitable legal disposal site. The maximum allowed water content of these solids is 50% of weight.

Due to a limited storage space at the worksites, dewatering and disposal work shall be concurrent with drilling operations. Treatment of water shall satisfy regulatory agencies before it is discharged.

END OF SECTION

**SECTION 02741SC
REMOVAL AND REPLACEMENT OF EXISTING PAVEMENT
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**SECTION 02741SC
REMOVAL AND REPLACEMENT OF EXISTING PAVEMENT**

PART 1. GENERAL

1.1 SCOPE

- A. The Contractor shall furnish all labor, materials, equipment and incidental required to remove and replace existing pavements defined as Class “A” Pavement Patch as shown on the Drawings as required for the construction of new pipelines and structures.
- B. Remove existing pavements as directed. After pipe laying and backfilling operations are completed, place the pavement.
- C. The Contractor will be required to hose clean all road surfaces after backfilling and before any surfacing, but in no case will pavement be placed until the trench material is dry.
- D. The Contractor shall maintain pavement under this Contract during the guarantee period of one year and shall promptly refill and repave areas which have settled or are otherwise unsatisfactory for traffic.
- E. The Contractor shall furnish and spread calcium chloride on disturbed surfaces to allay dust conditions. Calcium chloride shall conform to AASHO M-144, except that the pellet or flake shall be equally acceptable.
- F. Permanent pavement shall be placed over a backfilled trench promptly after completion of the backfilling. Repaving may be delayed if the Engineer so directs, but in such case temporary pavement replacement shall be required.
- G. If, in the opinion of the Engineer, the placing of temporary pavement is necessary, the Contractor shall place the temporary pavement as described hereinafter.

1.2 RELATED WORK

- A. Section 02315 - Excavation, Trenching, Backfill for Utilities.

1.3 SPECIFICATIONS

- A. Except as otherwise specified herein, the Standard Specifications for Highway Construction as issued by the State of South Carolina, Department of Highways and Public Transportation, shall apply to material requirements for temporary and permanent replacement of pavements removed in excavation of trenches.

PART 2. PRODUCTS

2.1 ROADWAY SURFACE

- A. Hot Mix Asphalt Concrete Surface Courses shall be as defined by SC-DOT.

2.2 TEMPORARY PAVEMENT

- A. Where directed by the Engineer, the Contractor shall place temporary pavement with top matching the grade of existing pavement. The material shall be 1-¹/₂" of Hot Laid Asphaltic Concrete Surface Course and 6" of Stabilized Aggregate Base Course.

PART 3. EXECUTION

3.1 CUTTING PAVEMENT

- A. The Contractor shall cut and remove pavement as necessary for installing the new pipe lines and appurtenances and for making connections to existing pipe lines.
- B. Before removing pavement, the pavement shall be marked for cuts nearly paralleling pipe lines and existing street lines. Asphalt pavement shall be cut along the markings with a jackhammer, rotary saw or other suitable tool. Concrete pavement, and asphalt pavement on concrete base, shall be scored to a depth approximately two (2) inches below the surface of the concrete along the pavement may be broken below the scoring with a jackhammer or other suitable equipment.
- C. No pavement shall be machine pulled until completely broken and separated along the marked cuts.
- D. The pavement adjacent to pipeline trenches shall neither be disturbed nor damaged. If the adjacent pavement is disturbed or damaged, irrespective of cause, the Contractor shall remove the damaged pavement and shall replace it at his own expense.

3.2 HOT MIX ASPHALT PAVEMENT CONSTRUCTION, REPAIR AND REPLACEMENT

- A. All existing pavement cut or damaged by construction under this contract shall be repaired to match the original surface material and original grade unless otherwise specified or shown on the Drawings. Materials and construction procedures for base course and pavement repair shall conform to the South Carolina Department of Transportation Specifications for the type of original surface.

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REMOVAL AND REPLACEMENT OF EXISTING PAVEMENT

- B. The work for new or for repair of existing pavement shall include the placing and compacting of the base course, the placing of the Portland Cement Concrete at the thickness specified in the details, the application of prime and tack coats where required, the placing and maintaining of the hot mix asphalt surface course at the thickness specified in the details, and all special requirements specified herein.
- C. The backfill shall be thoroughly compacted prior to concrete base.
- D. The asphalt surface course shall be thoroughly rolled or tamped with a mechanical roller or tamper.

3.3 CONCRETE PAVEMENT

- A. Where the installation of pipe involves the cutting of concrete, the cutting shall be kept to a minimum. Once the pipe is installed, the Contractor shall compact the trench to (98%) density according to the modified proctor. After compaction, Contractor shall install and compact a 6" thick graded aggregate base course. The base shall be poured and finished. Concrete shall be 3,000 psi and shall be equal or better than original pavement.
- B. When sidewalks are removed and replaced, match the existing finish and construct sidewalks as detailed on the plans.

3.4 CLEAN-UP

- A. After all repair and restoration or paving has been completed, all excess asphalt, dirt, rock and other debris shall be removed from the roadways. All existing storm sewers and inlets shall be checked and cleaned of any construction debris.

3.5 MAINTENANCE OF REPAIR

- A. All wearing surfaces shall be maintained by the Contractor in good order and be suitable for traffic at all times for a period of one year after completion and acceptance of the work. Approximately at the end of the maintenance period a final inspection will be made of the repaired surface and any settlement or of the repaired surface and any settlement or depression shall be adjusted as previously noted herein.

END OF SECTION

DIVISION 03 – CONCRETE

**SECTION 03300
CAST-IN-PLACE CONCRETE
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**SECTION 03300
CAST-IN-PLACE CONCRETE**

PART 1. GENERAL

1.1 SCOPE

Under this heading shall be included the furnishing of all labor, materials and equipment, tools and energy necessary to accomplish the cast-in-place concrete work to be constructed under this Contract, as shown on the Plans and hereinafter specified.

1.2 RELATED WORK

Section 02741SC

1.3 APPLICABLE STANDARDS

Where any material or operation is specified by reference to the following published specifications or standard or the specifications or standards of any other organizations, the referenced specification or standard shall be as much a part of this Section as if quoted in full herein.

A. American Concrete Institute (ACI).

1. 214 Recommended Practice for Evaluation of Compression Test results in Field Concrete.
2. 301 Suggested Specifications for Structural Concrete Buildings.
3. 305 Hot Weather Concreting
4. 306 Cold Weather Concreting
5. 315 Manual for Standard Practice for Detailing Reinforced Concrete Structures
6. 318 Building code Requirements
7. 347 Recommended Practice for Concrete Formwork
8. 350 Concrete for Sanitary Engineering Structures
9. 605 Recommended Practice for Hot Weather Concreting
10. 613 Recommended Practice for Cold Weather Concreting
11. 614 Recommended Practice for Measuring, Mixing and Placing Concrete

B. American Society for Testing and Materials (ASTM).

1. A36 Specification for Structural Steel
2. A185 Welded Steel Wire Fabric for Concrete Reinforcement
3. A615 Deformed and plain Billet-Steel Bars for Concrete Reinforcement
4. C31 Making and Curing Concrete Compression and Flexural Test Specimens in the Field
5. C33 Concrete Aggregates
6. C39 Test for Compressive Strength of Cylindrical Concrete Specimens
7. C42 Obtaining and Testing Drilled Cores and Sawed Beams of Concrete
8. C78 Test for Flexural Strength of Concrete
9. C94 Ready-Mix Concrete
10. C138 Test for Unit Weight, Yield and Air Content (Gravimetric) of Concrete
11. C143 Test for Slump of Portland Cement Concrete
12. C150 Portland Cement
13. C171 Sheet Materials for Curing Concrete
14. C172 Sampling Fresh Concrete
15. C192 Making and Curing Concrete Test Specimens in the Laboratory
16. C231 Air Content of Freshly Mixed Concrete by the Pressure Method
17. C260 Air-Entraining Admixture for Concrete
18. C470 Single Use Molds for Forming 6 x 12 Inch Test Cylinders
19. C494 Chemical Admixtures for Concrete

1.4 QUALITY ASSURANCE

A. The actual acceptance of aggregates and development of mix proportions to produce concrete conforming to the specific requirements shall be determined prior to the placement of any concrete, by means of laboratory tests made with the constituents to be used on the work.

B. Plant Qualification: Comply with all requirements of the Check List for Certification of Ready Mix Concrete production Facilities of the National Ready Mixed Concrete Association and ASTM C 94.

C. Worker Qualifications: Workers with at least 5 years experience in performing concrete work of high quality, including forming, color, texture and finishing and of the size and complexity of this project.

- D. Testing:
1. Provide testing in accordance with Section 01410. Keep the laboratory informed of testing schedule.
 2. Obtain standard laboratory compressive test cylinders as required by the laboratory when concrete is discharged from the mixer at the point of placing. Test cylinders will be made and cured by the laboratory in accordance with the requirements of ASTM C 31, including a set of 6 cylinders for each 50 cubic yards or fraction thereof placed each day, for each type of concrete. The cylinders will be cured under laboratory conditions and will be tested in two groups of three at 7 and 28 days of age, respectively in accordance with the requirements of ASTM C 39.
 3. Air entrainment tests will be made by the laboratory when concrete is discharged from the mixer at the point of placing, for each pour or other volume of concrete for which a set of test cylinders is required in accordance with the previous paragraph. The amount of air entrained will be determined by either the pressure method or the volumetric method in accordance with ASTM C231 or ASTM C173, respectively.
 4. The laboratory will make slump tests of Class A and Class B concrete as it is discharged from the mixer at the point of placing. Slump tests will be made of every batch of concrete placed, and failure to meet specified slump requirements will be sufficient cause for rejection of that batch.
- E. Evaluation and Acceptance of Concrete: Evaluation and acceptance of concrete will be in accordance with ACI-318. Chapter 5.

1.5 SUBMITTALS

- A. Submit the following information in accordance with Section 01300.
1. Plant Qualification: Submit satisfactory evidence indicating compliance with the specified qualification requirements.
 2. Materials: Submit satisfactory evidence indicating that materials to be used, including cement, aggregates and admixtures meet the specified requirements.
 3. Design Mix: Submit the design mix to be used as prepared by qualified persons. The design of the mix is the responsibility of the Contractor subject to the limitations of the Specifications.

1.6 TESTS

- A. All sampling and testing services shall be performed by a testing agency which operates in accordance to ASTM D 3740 and E 329 latest revision and accepted by the Engineer, at the Contractor's expense.

B. The Contractor shall submit to the Engineer, for review, the concrete materials and the concrete mix designs for each class of concrete proposed for use. This submittal shall include the results of all testing performed to qualify the materials and establish the mix designs. All mix designs shall be proportioned in accordance with Section 3.9 of ACI 301, Method 1 (trial batches) or method 2 (field experience). The average strength used as the basis for selecting proportions shall be specified in paragraph 3.9.2 or ACI 301.

C. The testing laboratory shall conduct strength tests of the concrete during construction in accordance with Section 16.3.4 of ACI 301. At least one strength test (6 test cylinders) shall be made for each 50 cubic yards or fraction thereof, of each mix design of concrete placed in any 1 day.

D. Slump tests shall be conducted regularly during construction in accordance with Section 16.3.5 or ACI 301.

E. The air content of the concrete sample for each strength test shall be determined in accordance with Section 16.3.6 of ACI 301.

F. Results of all tests shall be submitted to the Engineer, with copies to the Contractor. The test reports shall include the exact location in the work at which the batch represented by a test was deposited.

G. Evaluation of test results and acceptance of concrete shall be in accordance with chapter 17 of ACI 301.

H. Conformity of aggregates to these Specifications, and the actual proportions of cement, aggregates, and water necessary to produce concrete conforming to the requirements set forth in Table A, shall be determined by tests made with representative samples of the materials to be used on the work. Tests will be made by an accredited testing laboratory selected by the Contractor and approved by the Engineer.

I. Cement may be subject to testing to determine that it conforms to the requirements of this Specification. Methods of testing shall conform to the appropriate specification, but the place, time, frequency, and method of sampling will be determined by the Engineer in accordance with the particular need.

J. Samples of fine and coarse aggregates shall be delivered to the laboratory for examination and testing at least three weeks before the Contractor proposes to use them in the work.

K. Concrete shall be proportioned to provide an average compressive strength in accordance with ACI 318 part 3, Section 4.3, to establish a standard deviation test records. Where a concrete production facility does not have test records meeting these requirements the test required average compressive strength shall be as shown on Table D.

PART 2. PRODUCTS

2.1 MATERIALS

A. Cement:

1. Domestic Portland cement conforming to the requirements of ASTM C 150 type I, Type II or Type III. Construct sanitary sewer manholes, wet wells, pump stations and structures exposed to sewage with Type II cement. Use Type III cement for high early strength concrete only for special locations and only with the approval of the Engineer. Use Type I cement for tremie concrete.
2. Use only one brand of cement in any individual structure unless otherwise approved by the Engineer. Do not use cement which has become damaged, partially set, lumpy or caked and discard the entire contents of the sack or container which contains such cement. Do not use salvaged or reclaimed cement.

B. Aggregates:

1. ASTM C 33. Coarse aggregates shall be size No. 67, ¾-inch to No. 4 or No. 57, 1-inch to No. 4, as shown on the Drawings, unless otherwise directed by the Engineer. Use size No. 8 for filling of cells of masonry units.

C. Water: Potable quality, clean and free from injurious amounts of deleterious materials.

D. Air Entraining Admixture: ASTM C 260.

E. Water Reducing and Retarding Admixture.

1. Concrete Without Superplasticizer:

- a. Water Reducing Admixtures: ASTM C494 Type A, equal to Eucon WR-75 by the Euclid Company, pozzolith 200N by Master Builders, Plastocrete 161 by Sika Chemical Corporation, and containing no calcium chloride.
- b. Water Reducing and Retarding Admixtures: ASTM C494 Type D, equal to Eucon Retarder-75 by the Euclid Company, Pozzololith 100 XR by Master Builders, Plastiment by Sika Chemical Corporation,

- and containing no calcium chloride.
- c. Accelerating Admixtures: ASTM C494 Type C or E, equal to Accelguard 80 by the Euclid Company, Darex Set Accelerator by W.R. Grace, and containing no calcium chloride.
2. Concrete With Super-plasticizer:
- a. Water Reducing, High Range Admixtures: ASTM C494, Type F or G, equal to Eucon 37 by the Euclid Company, Rheobild 716 by Master Builders, Daracem 100 by W.R. Grace, Sikament by Sika Chemical Corporation, and consisting of a second-generation admixture, free of chlorides and alkalis (except for those attributable to water) composed of a synthesized sulfonated complex polymer, enabling the concrete to maintain its rheoplastic state in excess of two hours if necessary.
 - b. Manufacturer's Job Site Representation: Provide the services of a competent field service representative from the manufacturer of each of the admixtures selected for use to provide at the job site advice and consultation on the use of the admixture materials, including the effect on the concrete in place, including recommending maximum discharge time for super-plasticizer method and procedure to induce super-plasticizer into mixer, quantities of admixtures to be used if variations are required because of temperature/humidity, wind, or other environmental considerations, and to be available on short call at any time requested by the Owner, Contractor, or concrete producer.
- F. Curing Compound: ASTM C 309, Type I and Type ID, Class A and Class B, containing no ingredient which would adversely affect the bond of coatings or toppings.
- 1. For exposed concrete not to receive special finishes, protective coatings and/or concrete toppings, provide curing and sealing compound equal to Super Rez-Seal, by Euclid Chemical Co., or Burke Spartan-Cote Cure-Seal Hardener by The Burke Company.
 - 2. For exposed concrete to receive special finishes, protective coatings and/or concrete toppings, provide curing compound equal to Kurez-DR, by Euclid Chemical Co., or Burke Rez-X Curing Compound by The Burke Company.
- G. Mortar for Repair of Concrete: Same materials as used for concrete, except omit coarse aggregate and use not more than one part cement to two and one-half parts sand by damp loose volume. Use no more mixing water than is necessary for handling and placing.
- H. Burlap Mats: Conform to AASHTO Specification M182.

- I. Epoxy Bonding Agent: Euco #452, BurkEpoxy MV, Sikadur Hi Mod, Concrevisive 1001-LPL, or equal.

- J. Powdered Epoxy Coating For Anchor Bolts: Powdered epoxy resin as manufactured by the 3M Company, Scotchkote No. 213, Armstrong No. R349, or equal.

2.2 MIXES

A. General Requirements:

- 1. Mix Design: Conform to ACI 318, Section 5.3. Submit data on consecutive tests and standard deviation.
- 2. Maximum Water-Cement Ratio:
 - .37 (lbs/lb) - Concrete with super-plasticizer
 - .45 (lbs/lb) - Class A concrete without super-plasticizer
 - .55 (lbs/lb) - Class B concrete without super-plasticizer
- 3. Air Content: 5 percent plus or minus 1.5 percent (Class A and B).
- 4. Slump: 4-inches plus or minus 1-inch for Class A and B without Super-plasticizer.
7-inches plus or minus 1-inch for Class A and B with Super-plasticizer
8-inches plus or minus 1-inch for tremie concrete.
- 5. Minimum Compressive Strength at 28 days:
 - Tremie, 4000psi
 - Class A, 4000 psi, structural and slabs on grade
 - Class B, 3000 psi, sidewalks

B. Production of Concrete:

- 1. General: use ready mixed concrete, batched, mixed and transported in accordance with ASTM C 94, unless otherwise indicated.
- 2. Air Entraining Admixture: Add admixture into the mixture as a solution measured by means of an approved mechanical dispensing device, and as part of the total mixing water.
- 3. Water Reducing and Retarding Admixture: Measure and add water reducing and retarding admixture as recommended by the manufacturer. Complete the addition of the admixture within one minute after addition of water to the cement has been completed, or prior to the beginning of the last three-quarters of the required mixing, whichever occurs first. Store, handle and batch admixtures in accordance with the recommendations of ACI 68.

C. Delivery Tickets: Conform to ASTM C94, including cement content and

water/cement ratio. Furnish ticket for each batch of ready-mixed concrete delivered to the site.

- D. Temperatures: Deliver concrete to site at temperature not higher than 90° F, otherwise, add ice to reduce the temperature, as recommended by ACI.
- E. Modifications To The Mix: Do not make modifications to the mix in the plant or on the job which will decrease the cement content or increase the water-cement ratio beyond that specified.

PART 3. EXECUTION

NOT USED

END OF SECTION

**SECTION 03601
GROUT (NON-SHRINK)
INDEX**

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**SECTION 03601
GROUT (NON-SHRINK)**

PART 1. GENERAL

1.1 SCOPE

- A. Under this heading shall be included the furnishing and installation of all non-shrink grouts, complete.

PART 2. PRODUCTS

2.1 MATERIALS

- A. Non-Shrink/Non-Metallic Grout (Type "A").
1. Grout shall be factory mixed containing natural aggregates formulated to be used at any consistency from extremely fluid to damp pack. The grout shall be similar in finished appearance to concrete and mortar. The grout shall be free of gas producing agents, oxidizing catalysts and inorganic accelerators.
 2. Strength of the grout in-place shall meet or exceed the following:

4,000 psi	at	24 Hours
6,000 psi	at	72 Hours
7,500 psi	at	7 Days
9,500 psi	at	28 Days
 3. Grout shall be mater-Builders Masterflow 713 Grout, or equal.
- B. Non-Shrink/Metallic Aggregate Grout Type "B".
1. Grout shall be factory mixed, containing specially graded and processed ferrous metallic cementitious system formulated to be used at any consistency from extremely fluid to damp pack. The grout shall be free of gas producing agents, oxidizing agent and organic accelerators.
 2. Strength of the grout in-place shall meet or exceed the following:

4,000 psi	at	24 Hours
6,000 psi	at	72 Hours
8,000 psi	at	7 Days
10,000 psi	at	28 Days
- C. Water: Water shall be potable.

2.2 GROUTING SCHEDULE

NOT USED

PART 3. EXECUTION

3.1 SURFACE PREPARATION

A. General:

1. Concrete surfaces to receive grout shall be rough and reasonably level. Laitance shall be removed to sound concrete. The surfaces, including bolt holes shall be saturated with water for 24 hours prior to grouting.
2. Where grout is to be used to repair damaged concrete surfaces, the damaged or honeycombed concrete shall be removed to sound concrete by chipping.
3. Metal surfaces to receive grout shall be cleaned of oil, grease and other deleterious substances by means of appropriate solvents, wire brushing or a combination of both.

B. Formwork:

1. Forms shall be provided for grout placed at a flowable or fluid consistency.
2. Forms shall be strong, tight and shall be braced so they will not leak or buckle under the weight of fluid grout.
3. Forms shall be caulked with grout or a sand-cement mortar to prevent leakage. Expanded polystyrene or other means shall be used to caulk between foundation and portions of the element being grouted to seal off areas where grout is not required.

3.2 GROUT PREPARATION

- A. Grout shall be mixed in a paddle type mortar mixer or other suitable mechanical mixer. Hand mixing will not be permitted. Grout shall be mixed to a consistency according to the method of placement (damp pack or fluid) without overuse of water to the extent to cause bleeding. The grout manufacturer's instructions shall be strictly adhered to and the grout shall be mixed a minimum of 3 minutes and placed immediately. Mixing water temperature shall not be less than 40 Degrees F not exceed 80 Degrees F.

3.3 GROUT PLACEMENT

- A. Grout shall be placed at a temperature of 65 Degrees-75 Degrees F. The contractor shall maintain this temperature range for 24 hours following installation, thereafter

above 40 Degrees F. until the strength exceeds 4,000 psi.

- B. Grout shall be placed quickly and continuously and shall not be vibrated or overworked.

3.4 CURING

- A. Ponding or soaking wet cloth shall be applied within 10 minutes after grouting and shall be continued for 3 hours.

END OF SECTION

DIVISION 11 – EQUIPMENT

**SECTION 11000
GENERAL REQUIREMENTS FOR EQUIPMENT
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**SECTION 11000
GENERAL REQUIREMENTS FOR EQUIPMENT**

PART 1. GENERAL

1.1 SCOPE

- A. This section specifies general requirements which are applicable to all mechanical equipment in these specifications. The Contractor is responsible for ensuring that all mechanical equipment meets the requirements of this section in addition to the specific requirements of the individual equipment specification section.
- B. The work described by this Section consists of general requirements for furnishing and installing all materials and equipment specified for all items listed herein, and the furnishing of the services of a competent factory representative to supervise and/or inspect the installation and initial operation of all equipment and instruct the Owner's personnel in the proper use and maintenance of the equipment. The estimated number of days of service to be furnished during the periods of installation and initial operation shall be a minimum of one working day.
- C. The Contractor shall furnish, install, test, adjust and paint in accurate, satisfactory, workmanlike manner, all machinery, equipment, apparatus, accessories, and fittings required for the completion of the work in accordance with the Drawings, this Section, other pertinent Sections, and in accordance with the drawings, specifications, and directions for erection furnished by each equipment manufacturer.
- D. The Contractor shall furnish and install all materials including electric wiring, conduits, and control not furnished by the equipment manufacturers. The Contractor's attention is directed to the General Requirements and reference to requirements for furnished shop drawings.

1.2 CODES AND STANDARDS

- A. The Contractor shall obtain and pay for all licenses, permits, fees and charges. The Contractor shall be responsible for all charges for the use of property other than the site of the work for storage of materials or other purposes.
- B. The Contractor shall comply with all ordinances, laws, regulations, and codes applicable to the work involved. This does not relieve the Contractor of work shown or specified which may be beyond the scope of such ordinances, laws, regulations and codes.
- C. Regular inspections shall be requested by Contractor as required by governing codes

or regulations.

- D. The Williams-Steiger Occupational Safety and Health Act of 1970, Public Law 91-596, shall apply to the mechanical work.

1.3 SUPERVISORY SERVICES

- A. The periods of installation and initial operation shall be assumed to occur on successive days, unless otherwise stated herein. If the Contractor fails to arrange his work so that all services may be performed on successive days, he will be required to furnish such services at a later date, at no additional expense to the Owner. Periods of service on more than one (1) item furnished by the same manufacturer may run concurrently, if so approved and permitted by the Engineer, Manufacturers, who are required to furnish supervisory and/or inspection services, shall extend those services to include all equipment furnished by them for the Project, whether listed or not.

1.4 EQUIPMENT BIDS

- A. Equipment Manufacturer

Any reference to an item of equipment or material by a specific manufacturer's trade name in the Specifications is intended as a standard. Even though named in the Specifications, equipment offered with smaller or lightweight members, inferior or inefficient mechanism or devices compared to that specified will not be approved for the project. Each bidder is required to state in his bid the name of at least one (1) manufacturer or supplier named in these Specifications for each major item of equipment and his bid price for that item as required in the Proposal.

- 1. Substitute Equipment

Equipment offered under "Substitute Equipment" of the proposal shall comply with requirements of these Specifications. It shall be the responsibility of the Bidder to determine that equipment offered in the Proposal is in accordance with the Specifications. Substitute equipment offered at a lower price by reason of smaller or inefficient members, inferior or inefficient mechanism or devices will not be considered.

- 2. Substitute Equipment Bid

The price bid for substitute equipment shall include the cost of all changes in the structure, mechanical, electrical work, and other appurtenances, including engineering costs from redesign, for the accommodation of such equipment, as determined by the Engineer, at the expense of the Contractor.

B. Information Required

It shall be the responsibility of the Bidder to ascertain that each manufacturer named in his Proposal has submitted to the Engineer at least fifteen (15) days in advance of the letting date complete information in regard to the equipment offered. For makes of equipment named in the Specifications this may be a statement that the equipment offered is in strict accordance with the Engineer's Specifications, listing any and all exceptions. For all substitute items of equipment, complete drawings, specifications, thickness and weights of principal parts shall be furnished to the Engineer fifteen (15) days prior to the letting date. A list of all substitute equipment, which has been submitted in accordance with the above, will be provided to all Bidders by addendum prior to the receipt of bids.

C. Experience and Manufacturer

It is desired that only equipment which has undergone thorough development as provided by successful service in similar installations for at least five (5) years shall be accepted for installation unless specified elsewhere in these specifications. Manufacturers and/or equipment which does not meet the five (5) year experience period will be considered if the manufacturer or supplier provides a bond or cash deposit which will guarantee replacement of the equipment or process in the event of failure or unsatisfactory service. Manufacturers and/or equipment which does not meet the five (5) year experience period will be considered if the manufacturer or supplier provides a bond or cash deposit which will guarantee replacement of the equipment or process in the event of failure or unsatisfactory service. The amount of the bond or cash deposit shall be sufficient to cover all labor and equipment costs for replacement in addition to any costs incurred by the Owner because of failure or unsatisfactory service. The period of time for which the bond or cash deposit is required shall be two (2) years.

D. Standardization

To avoid a division of responsibility among several manufacturers for items of equipment having functions related to each other or to the same portion of the treatment process, and to avoid unnecessary duplication of replacement parts and service calls by the Owner, unless otherwise permitted herein, the equipment supplied under any numbered section shall be the product of, or furnished and guaranteed by, one (1) manufacturer.

1.5 EQUIPMENT OBTAINED FROM EQUIPMENT MANUFACTURER

The Contractor shall obtain all equipment specified, and that required for the safe condition and use of that equipment, from the manufacturer of the equipment, unless excluded by provisions in this paragraph or specifications for the item.

- A. Equipment which is offered in violation of the above provisions will be subject to rejection. In every case, approval of equipment drawings for construction will be withheld until all such materials have been included on the drawings or list of materials to be supplied by the manufacturer.
- B. Unless otherwise stated in the Specifications, the following type of materials shall not be considered part of the equipment; connecting piping and valves, motor starters and wiring, steps and manholes installed separately from equipment, finish painting, etc.

1.6 EQUIPMENT APPROVAL

Unless otherwise specified herein and as a minimum, each manufacturer furnishing equipment shall submit the following information to the Engineer for approval.

- A. Four (4) sets of certified drawings, guaranteed performance curves, wiring diagrams, specifications, and lists of electrical controls, including manufacturer's name and catalog number, furnish horsepower, normal full load and maximum load ampere rating of each motor.
- B. Estimated weight of each unit.
- C. List of spare parts and tools furnished with equipment. Unless otherwise specified herein, tools shall be only such special tools required by the particular equipment.
- D. Within six weeks after above approval, four (4) sets of complete installation and operation instructions and parts lists

1.7 MECHANICAL TESTING

After each unit has been installed and is ready for operation, it shall be operated continuously for a period of 24 hours. During that period, the equipment will be inspected for defects and weaknesses. Parts of the unit which show a defect or weakness, or both, shall at once be removed and be replaced with new parts or be made good in a satisfactory manner, at no additional expense to the Owner.

- A. Continuous 24-hour tests shall be made after all defects have been remedied, at no additional expense to the Owner.

- B. After installation and final testing, each equipment manufacturer furnishing supervision and/or inspection services shall make written certification to the Engineer and Owner that the equipment and controls have been properly installed in accordance with the drawings, specifications, and manufacturer's requirements, and that the required operating and maintenance instructions have been furnished to the Engineer.

1.8 PIPING FOR EQUIPMENT

The Contractor shall furnish completely dimensioned layouts for all piping, fittings, valves, specialties, and other equipment. Deviations from the dimensions shown on the drawings caused by equipment dimensions shall be taken into consideration by the Contractor and changes in piping, electrical conduit, and other similar items shall be done at no additional expense to Owner.

- A. All piping and appurtenances shall be properly supported by a system of hangers, pipe stands, saddles, base ells, and concrete piers as required. Concrete inserts, bolts, anchors, etc., shall be placed in the forms before placing concrete.
- B. Drip piping, $\frac{3}{4}$ inch in size, shall be provided for all pumps; use crosses and plugs at all changes for direction. Piping shall be run to nearest drain in a manner which will not constitute a hazard to foot traffic. Furnish plug valve, or stopcock, bleeds for high points in piping for all pump units.

1.9 PAINTING

NOT USED

1.10 OPERATION AND MAINTENANCE MANUALS

Before the equipment is placed in service, the Contractor shall have a minimum of one set of operation and maintenance manuals onsite in addition to the number of manuals specified in Section 01730.

1.11 GUARANTEES

The Contractor shall guarantee the equipment to be free from defects in workmanship, design, and materials for a period of one (1) year after initial operation begins; the contractor shall replace at no additional expense to the Owner, every defective part, and every part showing undue wear, during that guarantee period. The date of initial operation shall be only after approval by the Engineer and shall be furnished in writing to the Contractor.

1.12 SPARE PARTS & TOOLS

- A. Each equipment manufacturer shall furnish all recommended spare parts and tools from the list of spare parts and tools recommended by the manufacturer in the operation and maintenance manual in addition to those spare parts specified herein this document. The Contractor shall be responsible for providing spare parts and tools.

- B. Spare parts shall be tagged by project equipment number and identified as to part number, equipment manufacturer, and subassembly component (if appropriate). Spare parts subject to deterioration such as ferrous metal items and electrical components shall be properly protected by lubricants or desiccants and encapsulated in hermetically sealed plastic wrapping. Spare parts with individual weights less than 50 pounds and dimensions less than 2 feet wide, or 18 inches high, or 3 feet in length shall be stored in a wooden box with a hinged wooden cover and locking hasp. Hinges shall be strap type. The box shall be painted and identified with stenciled lettering stating the name of the equipment, equipment numbers, and the words "spare parts". A neatly typed inventory of spare parts and tools shall be taped to the underside of the cover.

PART 2. PRODUCTS (Not Used)

PART 3. EXECUTION

3.1 VERIFICATION OF CONTRACT PLANS

- A. The Plans indicate certain required pipe sizes and the general arrangement for major piping and equipment. Layout and arrangement for certain other piping systems shall be provided in conformance to the equipment items furnished and shall be provided in conformance to the equipment items furnished and shall be verified in the field by the Contractor. Valves and fittings furnished shall be of such dimensions to allow for the installation of piping substantially as shown on the Plans. In the event, it should become necessary to change the location of any of the work due to interference with other work, the Contractor shall consult with the Engineer before making any changes. Any such changes shall be made without added cost to the Owner. Under no circumstances shall the pipe sizes indicated on the Plans be changed without first having notified the Engineer.

- B. The Contractor shall determine and be responsible for the proper locations and character of all inserts for hangers, chases, sleeves and other openings in the construction required for all mechanical piping work.

- C. The final location of inserts, hangers, etc., required for the mechanical piping installation shall be coordinated with facilities required for other installations to prevent interference.

- D. The final length and location of required pipe connections to all process equipment

shall be coordinated to meet the requirements and recommendations of the equipment manufacturer.

- E. The Contractor shall install no work that directly connects to equipment until such time as complete shop drawings of such equipment have been submitted to the Engineer.
- F. The drawings are essentially to scale as noted but the Contractor shall refer to other drawings for exact location of access doors, equipment, etc.
- G. The Contractor, before roughing in any facilities or installation of any equipment, shall consult all drawings, general, mechanical, electrical, etc. and shall inform himself of materials, finishes, location of pipes, conduits, etc., which may affect the installation.
- H. Discrepancies discovered before or after work has started, shall be brought to the attention of the Engineer immediately and the Engineer reserves the right to require minor changes in the work of any Contractor to eliminate such discrepancies.
- I. The Plans and Specifications are complementary and what is called for in either one shall be binding as if called for in both.

3.2 NAMEPLATES AND IDENTIFICATION TAGS

- A. Each piece of equipment furnished as a part of the respective mechanical piping system, shall have a standard nameplate securely affixed thereto in a conspicuous place, showing the serial number and the name of the manufacturer. In addition, the nameplate shall show the rated capacity of the unit at specified conditions. Motor nameplates shall show the horsepower, speed and electric current characteristics. The nameplates of a distributing agent will not be acceptable.

3.3 CAUTION SIGNS

- A. Equipment with guarded moving parts which operates automatically or by remote control shall be identified by signs reading 'CAUTION – AUTOMATIC EQUIPMENT MAY START AT ANY TIME'. This includes the four supply and exhaust fans. Signs shall be constructed of fiberglass material, minimum 0.1 inch thick, rigid, and suitable for post mounting. Letters shall be black on a yellow background.

3.4 LUBRICANTS

- A. The Contractor shall provide for each item of mechanical equipment a supply of the lubricant required for the commissioning period. Lubricants shall be of the type recommended by the equipment manufacturer and shall be products of the Owner's

current lubricant supplier. The Contractor shall limit the various types of lubricants by consolidating them, with the equipment manufacturer's approval, into the least number of different types. Not less than 90 days before the date shown in his construction schedule for starting, testing and adjusting equipment, the Contractor shall provide the Owner with five copies of a list showing the required lubricants by name and type, after consolidation, for each item of mechanical equipment. The list shall show estimated quantity of lubricant needed for a full year's operation, assuming the equipment will be operating continuously.

3.5 ANCHOR BOLTS

- A. Anchor bolts shall be designed for lateral forces for both pullout and shear in accordance with ANSI A58.1 for Seismic Zone 2. Unless otherwise specified anchor bolts shall be hot-dip galvanized or type 304 stainless steel. Nuts and washers shall be the same material as the anchor bolt.

3.6 PAINTING

- A. All equipment, motors, drive assemblies and bases shall be furnished with a factory paint finish which is compatible with the paint specified under the Painting Section of this Specification. Pipe materials shall be factory primed as specified for the particular pipe system hereinafter. All field painting, touch-up paint, and stenciling is specified under the section of this Specification titled Painting.

3.7 PRESSURE TESTING

- A. All mechanical piping systems shall be pressure tested after installation. All liquid systems shall be tested hydrostatically or pneumatically at the Contractor's option. If air pressure is used for testing, the contractor shall be responsible for all safety precautions necessary to prevent possibility of personal injury in the event of blow-off or material failure during test.
- B. All systems shall be tested at the pressure level specified hereinafter, or if not specified, at a pressure of at least 150 percent of maximum operating pressure. After bringing the system to the required pressure, it shall be left for at least one hour and shall show no loss in pressure due to leakage.
- C. If leakage is detected, the cause shall be determined and corrected, and the test shall be conducted again at the expense of the Contractor.

END OF SECTION

DIVISION 15 – MECHANICAL

SECTION 15064
PLASTIC PIPE, TUBE HOSE AND FITTINGS
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SECTION 15064
PLASTIC PIPE, TUBE HOSE AND FITTINGS

PART 1. GENERAL

1.1 SCOPE OF WORK

- A. Furnish all labor, materials, equipment and incidentals required and install in the locations as shown on the Drawings, the plastic piping, fittings and appurtenances as specified herein.

1.2 RELATED WORK

- A. Submersible Raw Sewage Pumps and Accessories, Section 15302.
- B. Valves and appurtenances are included in Section 15100.

1.3 DESCRIPTION OF SYSTEM

- A. Piping shall be installed in the locations as shown on the Drawings.

1.4 QUALIFICATIONS

- A. All plastic pipe, fittings and appurtenances shall be furnished by manufacturers who are fully experienced, reputable, and qualified in the manufacture of the items to be furnished. The equipment shall be designed, constructed, and installed in accordance with the best practices and methods and shall comply with these Specifications.

1.5 SUBMITTALS

- A. Shop drawings shall be submitted to the Engineer for approval in accordance with the Section 01300 and shall include dimensioning and technical specification for all piping to be furnished.
- B. Submit to the Engineer, for approval, samples of all materials specified herein.

1.6 TOOLS

- A. Special tools, solvents, lubricants, and caulking compounds required for normal installation shall be furnished with the pipe.

PART 2. PRODUCTS

2.1 PVC PIPE AND FITTINGS

- A. PVC pipe shall be rigid, unplasticized polyvinyl chloride (PVC) pipe and shall be in accordance with ASTM D-1784 and ASTM D-1785, Class PVC 1120 in conformance with AWWA C-900, Class 150 psi.
- B. The pipe shall be suitable for field cutting, welding, bending and shall be Schedule 80 unless otherwise shown on the Drawings and of the sizes as shown on the Drawings.
- C. All pipes shall be bundled or packaged in such a manner as to provide adequate protection for the ends, threaded, or flanged, during transportation from the manufacturer.

2.2 POLYETHYLENE PIPE AND FITTINGS

- A. The pipe shall be made from high density polyethylene resin compound qualified as Type III, Category 3, Class C by ASTM D1248 with a minimum density of 0.955.
- B. The polyethylene compound shall be suitably protected against degradation by ultraviolet light as required by ASTM D1603.
- C. If rework compounds are required, only those generated in the manufacturer's own plant from resin compounds of the same class and type from the same raw material supplier shall be used.
- D. Pipe shall be designed for a working pressure of 100 psi in accordance with ASTM D3035.
- E. Pipe shall be joined by the butt-fusion process as recommended by the manufacturer.
- F. Installation lengths shall be joined by the use of PVC insert adaptors with clamps. Clamps and screws shall be Type 304 stainless steel.
- G. Termination to pipes, valves, or fittings made of other material shall be by flanged or threaded PVC adaptors. The pipe adjacent to these joints and to the joints themselves must be rigidly supported for a distance of one pipe diameter beyond the joint.

2.3 PLASTIC HOSE

NOT USED

2.4 APPURTENANCES

NOT USED

PART 3. EXECUTION

3.1 INSTALLATION

- A. The installation of plastic pipe shall be strictly in accordance with the manufacturer's technical data and printed instructions.
- B. Installation of valves and fittings shall be strictly in accordance with manufacturer's instructions. Particular care shall be taken not to overstress threaded connections at sleeves.
- C. All pipe joining shall use restrained joints, to be pre-approved by Engineer.
- D. All piping shall have a sufficient number of unions to allow convenient removal of piping and shall be as approved by the Engineer.
- E. All plastic pipe to metal pipe connections shall be made using flanged connections. Metal piping shall not be threaded into plastic fittings, valves, or couplings, nor shall plastic piping be threaded into metal valves, fittings or couplings.

3.2 FIELD PAINTING

NOT USED.

3.3 INSPECTION AND TESTING

- A. All pipelines shall remain undisturbed for 24 hours to develop complete strength at all joints. All pipelines shall be subjected to a hydrostatic pressure test for 4 hours at full working pressure. All leaks shall be repaired and lines retested as approved by the Engineer. Prior to testing, the pipelines shall be supported in an approved manner to prevent movement during tests.

END OF SECTION

SECTION 15100
VALVES AND APPURTENANCES
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SECTION 15100
VALVES AND APPURTENANCES

PART 1. GENERAL

1.1 SCOPE OF WORK

- A. Furnish all labor, materials, equipment and incidentals required and install complete and ready for operation all valves and appurtenances as shown on the Drawings and as specified herein.
- B. All valves complete with pneumatic or manual operators as required shall be furnished by a single manufacturer and shall be coordinated with instrumentation and controls furnished.
- C. The equipment shall include, but not be limited to, the following:
 - a. Check valves
 - b. Plug valves
 - c. Valve boxes

1.2 RELATED WORK

- A. Pump Station specification, 15302

1.3 DESCRIPTION OF SYSTEMS

- A. All of the equipment and materials specified herein are intended to be standard for use in controlling the flow of water, sludge, chemicals, etc., depending on the applications.

1.4 QUALIFICATIONS

- A. All of the types of valves and appurtenances shall be products of well-established reputable firms who are fully experienced, reputable and qualified in the manufacture of the particular equipment to be furnished. The equipment shall be designed, constructed and installed in accordance with the best practices and methods and shall comply with these specifications as applicable.

1.5 SUBMITTALS

- A. Submit to the Engineer within 30 days after execution of the contract a list of materials to be furnished, the names of the suppliers and the date of delivery of materials to the site.
- B. Complete shop drawings of all valves and appurtenances shall be submitted to the

Engineer for approval in accordance with the requirements by Section 01300 and the General Conditions.

1.6 TOOLS

- A. Special tools, if required for normal operation and maintenance shall be supplied with the equipment.

PART 2. PRODUCTS

2.1 GENERAL

- A. All valves and appurtenances shall be of the size shown on the drawing and shall be from one manufacturer.
- B. All valves and appurtenances shall have the name of the maker and the working pressure for which they are designed cast in raised letters upon some appropriate part of the body.

2.2 CHECK VALVES

- A. Check valves shall be swing type and shall meet the material requirements of AWWA Specification C508. The valves shall be single disc, 150 psi working water pressure, non-shock, and hydrostatically tested at 300 psi.

2.3 PLUG VALVES

- A. All plug valves shall be eccentric type. Port areas shall be at least 80 percent of full pipe area, with a minimum working Pressure rating of 150 psi.

2.4 VALVE BOXES

- A. All buried valves shall have cast iron two or three piece valve boxes with cast iron covers. Valve boxes shall be provided with suitable heavy bonnets and to extend to such elevation at or slightly above the finished grade surface as directed by the Engineer. Valve boxes shall be provided with concrete base and valve nameplate with suitable anchors for casting in concrete.

2.5 FLANGED ADAPTORS

NOT USED

2.6 FLEXIBLE COUPLINGS

NOT USED

2.7 FLEXIBLE CONNECTORS

NOT USED

2.8 UNIONS

NOT USED

2.9 HOSE VALVES AND BIBBS

NOT USED

2.10 PRESSURE GAUGES

NOT USED

2.11 WATER MAIN TAPS, CORPORATION STOPS, SADDLES

NOT USED

2.12 POTABLE WATER PIPE

NOT USED

PART 3. EXECUTION

3.1 INSTALLATION

NOT USED

3.2 SHOP PAINTING

NOT USED

3.3 FIELD PAINTING

NOT USED

3.4 INSPECTION AND TESTING

A. Completed pipe shall be subjected to hydrostatic pressure tests for four (4) hours at

full working pressure. All leaks shall be repaired and lines retested as approved by the Engineer. Prior to testing, the gravity pipelines shall be supported in an approved manner to prevent movement during tests.

END OF SECTION

SECTION 15302
SUBMERSIBLE RAW SEWAGE PUMPS AND ACCESSORIES
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SECTION 15302
SUBMERSIBLE RAW SEWAGE PUMP STATION AND ACCESSORIES

PART 1. GENERAL

1.1 SCOPE

- A. Under this heading shall be included the furnishing, testing and adjustment of a Duplex Grinder Pump Station. A complete pump station scope shall be supplied, to include all equipment, valves /appurtenances, wet-well and the installation and adjustment for the proper operation of the completed pump station, as specified in Drawing Set and herein these specifications.

1.2 GENERAL

- A. Each pump shall be a submersible grinder pumps rated for Low Flow, Low Head applications. Pumps shall be suitable for service in raw, unscreened sewage with 3 inch solids. Each motor shall be not less than 1 HP and shall be capable of pumping 14 gpm at 20-feet TDH.
Pump shall be, Zoeller 810, (with 1 HP, 230 volt /60hz, 1725 rpm motor) or approved equal.
- B. Cutter heads shall be stainless steel and pump motors shall be designed with temperature over-load protection.
- C. Shop drawings shall be submitted indicating anticipated performance curves of the following:
1. Capacity vs head curves.
 2. Brake horsepower curves.
 3. Hydraulic efficiency curves.
 4. Motor input KW curves.
 5. Certified motor data curves.
- D. Each curve shall cover full range of operation from shutoff to maximum capacity.
- E. Shop drawings shall show the principal dimensions of the pump assembly, including the size of suction and discharge and details of discharge connection, guide bars, guide brackets, shaft seals, lubrication system, motor and casing, and power cable attachment. Shop drawings shall be specifically detailed for this project.

PART 2. PRODUCTS

2.1 PUMP DESIGN

- A. The design of the pumps shall be such that the pump unit will be automatically and firmly connected to the discharge piping when lowered into place on its mating discharge connection. The pumps shall be easily removable for inspection or service, requiring no bolts, nuts or other fastenings to be disconnected. For this purpose, there shall be no need for personnel to enter the wet-well. The pumps and their appurtenances shall be capable of continuous submergence under water operation without loss of watertight integrity.

2.2 PUMP CONSTRUCTION

- A. All major parts, such as the stator casing, oil casing, sliding bracket, volute and impeller shall be of cast iron, ASTM A-48 Class 40. All surfaces coming into contact with waste shall be protected by a coating suitable for use in raw sewage. All exposed bolts and nuts shall be of stainless steel.
- B. A wearing ring system shall be installed to provide efficient sealing between the volute and impeller. The impeller shall be gray cast iron of non-clogging design, capable of handling solids, fibrous materials, heavy sludge and other matter found in normal waste applications. The impeller shall be constructed with a long through-let without acute turns. The impeller shall be dynamically balanced. Static and dynamic balancing operations shall not deform or weaken it. The impeller shall be a slip fit to the shaft and key driven. Non-corroding fasteners shall be used.
- C. Each pump shall be provided with a mechanical rotating shaft seal system running in an oil reservoir having separate, constantly hydro-dynamically lubricated lapped seal faces. The lower seal unit between the pump and oil chamber shall contain one stationary and one positively driven rotating tungsten-carbide ring. The upper seal unit between the oil sump and motor housing shall contain one stationary tungsten-carbide ring and one positively driven rotating carbon ring. Each interface shall be held in contact by its own spring system supplemented by external liquid pressures. The seals shall require neither maintenance nor adjustment, but shall be easily inspected and replaceable. Shaft seals without positively driven rotating members of conventional double mechanical seals with a common single or double spring acting between the upper and lower units, requiring a pressure differential to offset external pressure and effect sealing shall not be considered acceptable nor equal to the dual independent seal system specified. The shaft sealing system shall be capable of operating submerged to depths of, or pressures equivalent to 65 feet. No seal damage shall result from operating the pumping unit out of its liquid environment. The seal system shall not rely upon the pumped media for lubrication.
- D. A sliding guide bracket shall be an integral part of the pump unit. The volute casing

SECTION 15302-4
SUBMERSIBLE RAW SEWAGE PUMPS AND ACCESSORIES

shall have a machined discharge flange to automatically and firmly connect with the cast iron discharge connection, which when bolted to the floor of the sump and discharge line, will receive the pump dischargers connecting flange without the need of adjustment, fasteners, clamps, or similar devices.

- E. Installation of the pump unit to the discharge connection shall be the result of a simple linear downward motion of the pump unit guided by a rail tube system.
- F. No other motion of the pump unit, such as tilting or rotating shall be required. Sealing of the discharge interface by means of a diaphragm, O-ring or other device will not be considered acceptable nor equal to a metal-to-metal contact of the pump discharge flange and mating discharge connection specified and required. No portion of the pump unit shall bear directly on the floor of the wetwell. There shall be no more than one 90-degree bend allowed between the volute discharge flange and station piping.
- G. The pump motor shall be housed in an air-filled watertight casing and shall have moisture resistant Class F, 155 Degrees C. insulation. The motor shall be NEMA Design B and designed for continuous duty.
- H. The cable entry water seal design shall be such that it precludes specific torque requirements to insure watertight submersible seal. Epoxies, silicones or other secondary sealing system shall not be required or used. The cable entry junction box and motor shall be separated by a stator lead sealing gland or terminal board which shall isolate the motor interior from foreign materials gaining access through the pump top.
- I. Pump motor cable when installed shall be suitable for submersible pump applications and this shall be indicated by a code or legend permanently embossed on the cable. Cable sizing shall conform to NEC Specifications for pump motors shall be of adequate size to allow motor voltage conversion without replacing the cable.
- J. All mating surfaces or major parts shall be machined and fitted with nitrile O-rings where watertight sealing is required. Machining and fitting shall be such that sealing is accomplished by automatic compression in two planes and O-ring contact made on four surfaces, without the requirements of specific torque limits to affect this. Rectangular cross-sectioned gaskets requiring specific torque limits to achieve compression shall not be considered adequate or equal.
- K. Tolerances of all parts shall be such that allows replacement of any part without additional machining required to insure sealing as described above. No secondary sealing compounds, greases or other devices shall be used.
- L. Each unit shall be provided with an adequately designed cooling system. Thermal radiators integral to the stator housing, cast in one unit, are acceptable. Where water jackets alone or in conjunction with radiators are used, separate circulation shall be

provided. Cooling media channels and ports shall be non-clogging by virtue of their dimensions. Provisions for external cooling and flushing shall be provided.

2.3 GRINDER DESIGN

- A. The grinder shall be positioned immediately below the pumping elements and shall be direct-driven by a single, one-piece motor shaft. The grinder impeller assembly shall be securely fastened to the pump motor shaft. The grinder shall be of the rotating type with a stationary hardened and ground chrome steel shredding ring spaced in accurate close annular alignment to the driven impeller assembly, which shall carry two hardened Type 400 series stainless steel cutter bars. This assembly shall be balanced and operated without objectionable noise or vibration over the entire range of recommended operating pressures.
- B. The grinder shall be constructed so as to eliminate clogging and jamming under all normal operating conditions including starting. Vortex action shall be created to scour tank free of deposits or sludge banks which would impair the operation of the pump.
- C. The grinder shall be capable of reducing all components in normal domestic sewage, including "foreign objects," such as paper, wood, plastic, glass, rubber and the like, to finely divided particles which will pass freely through the passages of the pump and the 1-1/4 inch diameter discharge piping.
- D. Cutters shall be of the 5 tooth and 7 tooth design with two leading cutting edges on each tooth so as to cut in each direction without removing the cutters from the grinders.
- E. The grinder shall be so designed that when one cutting edge on the tooth of the cutter becomes worn, the entire grinder can be rotated 180° inline, or in channel; and by changing two power leads to the motor, the opposite cutting edge on the cutter tooth can be utilized.

2.4 ACCESS FRAME AND GUIDES

- A. An aluminum access hatch complete with 316 stainless steel hardware complete with counter balance, hinged and hasps-equipped covers, safety grate, upper guide holder and level sensor cable holder shall be included. Each door shall have a safety handle to maintain the door in the open position and a safety grate. Doors shall be of checkered aluminum plate. Cover guild bar holders shall be integral with the discharge connection. The guild bars shall not support any portion of the weight of the pump. Exterior frame which comes in contact with concrete shall have one coat of black paint. All frames shall drain to daylight using PVC pipe.

B. Guide System

1. The pumps shall be provided with a stainless steel guide system to allow easy removal of the pumps without entering the wet well. The guide system shall be provided extending from the top slab of the pump station to the discharge connection of each pump and shall assist in raising and lowering the pump unit. The discharge connection shall be bolted to the floor and shall serve as a lower attachment for the guide bars. The working load of the lifting system shall be 50% greater than the pump unit weight.
2. The pump unit shall be guided on the bars by a guide bracket which shall be an integral part of the pump. Each pump shall be fitted with sufficient length of stainless steel wire rope or chain capable of lifting the pump and motor. The guide system shall also include the "grip eye" lift and slings. The necessary fittings and eye bolts shall be provided.

2.5 LIQUID LEVEL SENSORS

- A. Liquid level sensors shall be provided where indicated and shall consist essentially of a mercury switch encapsulated in corrosion-resistant casing. The switch cable shall enter the casing through a watertight compression-type fitting suitable for use in corrosive environments. The casing shall contain an eccentric weight which is positioned to insure that the mercury switch tilts in the proper direction. The entire float switch assembly shall be designed for use in raw sewage.

2.6 CONTROLS

- A. Furnish and install one automatic pump control center in NEMA 4X Enclosure for service connection per manufacturer's requirement. For each pump there shall be included individual disconnect switches, magnetic contactors, hand-off automatic selector switches, running lights, amp-meters and elapsed time meters. An interlock/timer should be provided to keep pumps from starting at the same time. An alarm system consisting of an alarm light and horn, with silencing switch shall be provided. A 24-volt control circuit transformer with disconnect and overload protection shall be provided. A duplex weatherproof convenience outlet shall be provided. Terminal strips shall be provided for interface wiring between control panel and pumping station. The controls shall automatically alternate the operation of the pumps. Two 20 amp, one pole breakers shall be provided in the control panel as spares with four required for service.

2.7 CHECK VALVES

- A. Check valves shall be swing type and meet the requirements of AWWA-C508.

2.8 PUMP TEST

- A. Each pump shall be factory tested at various heads and efficiency. Certified curves shall be submitted to the Engineer.
- B. The pump cable end shall be sealed with a protective covering to make it impervious to moisture or water seepage prior to electrical installation.

2.9 FACTORY PUMP TESTS

- A. Pumps shall be tested at the factory. Pumps shall be tested at actual drive motor speed.
- B. Factory tests of the pumping equipment shall be made in accordance with the Test Code of Hydraulic Institute Standards and test curves for each pump shall have the capacity plotted as abscissas, and the operating head, brake horsepower, and efficiency plotted as ordinates. Test curves shall cover the full range of operation from shut-off to maximum capacity. The characteristics of the pumps shall conform with this Specification.
- C. All pumping equipment which fails to meet the requirements of the Test Code shall be removed and shall be replaced with pumping equipment which meet the Specifications requirements. Five notarized copies of certified factory performance test curves for each pump shall be furnished and approved before shipment of the pumps to the site.

PART 3. EXECUTION

3.1 FIELD TESTS, ADJUSTMENT AND START-UP

- A. After completion of installation, each pumping unit and all related equipment shall be inspected and approved by a representative of the manufacturer as being in compliance with the manufacturer's recommendations and requirements. After such inspection, the equipment shall be tested by the manufacturer's representative in the presence of the Owner and Engineer. Each pump shall meet the performance requirements.
- B. Field test results shall be within minus one percent and plus five percent tolerance and shall be certified by the pump manufacturer after field testing to be in conformance with the Contract Specifications. Pumps not meeting these requirements shall be replaced.

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SUBMERSIBLE RAW SEWAGE PUMPS AND ACCESSORIES

- C. Alignment of each pump unit shall be checked after installation of pump and piping to determine that the base is not distorted and pipe strain is not present.

3.2 PUMP /GRINDER WARRANTY

- A. The grinder manufacturer shall warrant the grinder in writing against defects in workmanship and material for a period of one year (minimum) of normal use, operation and service. The warranty shall be in printed form and apply to all similar units.
- B. The manufacturer shall furnish six sets of its Submittal Drawings, Operation and Maintenance Instruction Manuals and parts list.

3.3 MEASUREMENT AND PAYMENT

NOT USED

END OF SECTION

APPENDIX B - DRAWINGS

SANITARY SEWER IMPROVEMENTS FOR COLLETON COUNTY CAREER SKILLS CENTER

1085 THUNDERBOLT DR.
WALTERBORO, SC 29488

SHEET LIST TABLE		
Sheet No.	Sheet Title	Revision Date
C1	Title Sheet	11-12-19
C2	Sanitary Sewer Improvements Plan	08-13-19
C3	Construction Notes & Details	11-12-19



OWNER:
 Colleton County
 c/o Ms. Carla Harvey, PE
 County Engineer
 113 Mable T. Willis Blvd.
 Walterboro, SC 29488
 (843) 782-3104



USE OF THIS DRAWING FOR QUANTITY TAKE-OFFS AND PRICING SHOULD BE CONSIDERED PRELIMINARY SUBJECT TO COMPLETION OF FINAL DESIGN AND RECEIPT OF APPLICABLE REGULATORY APPROVALS.

**BLACKWATER CIVIL
 ENGINEERING
 CONSULTANTS, LLC**
 792 WILLIAMS RD., RUFFIN, SC
 29475
 (843) 866-2151
 WWW.BLACKWATERCIVIL.COM



TITLE SHEET
 COLLETON COUNTY CAREER
 SKILLS CENTER SEWER IMPROVEMENTS
 PREPARED FOR: COLLETON COUNTY
 TMS# 132-00-00-244
 NEAR WALTERBORO, COLLETON COUNTY, SC

DATE (MM/DD/YY)	06-28-19	CONSULTANT CONTACT	IMS	CONSULTANT JOB NUMBER	19-024
DESCRIPTION	GRADE (PUMP SPEC CHANGE)				
DATE (DD/MM/YY)	07-25-19				
REV	1				
	2				
DRAWING NO.	C1		SHEET OF	1 OF 3	
TITLE	TITLE SHEET				

- LEGEND**
- ▲ CALC POINT - CORNER NOT SET
 - IRON PIPE FOUND
 - IRON PIPE FOUND DISTURBED
 - AC AIR CONDITIONING UNIT
 - CC# CABLE JUNCTION BOX
 - ⊕ E ELECTRIC METER
 - ⊕ F FIRE HYDRANT
 - ⊕ P POWER POLE
 - X 12.9 SPOT ELEVATION
 - TEL TELEPHONE JUNCTION BOX
 - ⊕ TR TRANSFORMER-ELECTRIC
 - ⊕ W WATER METER
 - ⊕ V WATER VALVE
 - ⊕ S PVC STUBOUT MARKER
 - BSL BUILDING SETBACK LINE
 - IE INVERT ELEVATION
 - RCP REINFORCED CONCRETE PIPE
 - PVC POLYVINYL CHLORIDE PIPE
 - FENCE LINE
 - OVERHEAD POWER LINE
 - EDGE OF PAVEMENT
 - CONCRETE
 - GRAVEL
 - +34.0 PROPOSED SPOT ELEVATION
 - 33.0 PROPOSED CONTOUR
 - PROPOSED SURFACE DRAINAGE DIRECTION
 - SF PROPOSED SILT FENCING
 - LOC PROPOSED LIMITS OF CONSTRUCTION
 - TPF PROPOSED TREE PROTECTION FENCING
 - CL ROADWAY CENTERLINE
 - FM 2" PVC SEWER FORCE MAIN
 - PROPERTY LINE
 - 2" PVC SEWER LATERAL
 - ⊕ FM VALVE
 - ⊕ FM BENDS (RESTRAINED JOINT)

SITE / CONSTRUCTION NOTES:

1. PROPERTY TAX MAP NO. 132-00-00-244.
2. PROPERTY OWNED BY COLLETON COUNTY.
3. TOPOGRAPHICAL SURVEY BY SAMUEL C. BETHAY, PE, PLS. DATED MAY 8, 2019 AND PROVIDED ELECTRONICALLY ON MAY 9, 2019. VERTICAL DATUM IS BASED ON INFORMATION PROVIDED THAT THE FINISHED FLOOR ELEVATION OF THE BUILDING IS 95.00. HORIZONTAL DATUM IS NOT ASSOCIATED WITH S.C. STATE PLANE (NAD 83). BOUNDARY SHOWN IS FOR REFERENCE ONLY.
4. SURVEY DOES NOT SHOW ANY OF THE FOLLOWING WHICH MAY APPLY TO THIS PROPERTY: EASEMENTS (OTHER THAN THOSE VISIBLE, OBVIOUS, AND APPARENT AT THE TIME OF THE SURVEY), FRESHWATER WETLANDS, ZONING OR LAND USE REQUIREMENTS, OR ANY OTHER INFORMATION THAT A CURRENT TITLE SEARCH MAY REVEAL.
5. THE LOCATION OF EXISTING UTILITIES SHOWN ON THESE PLANS ARE APPROXIMATE. FURTHERMORE, INFORMATION REGARDING UNDERGROUND UTILITIES SHOWN ON THESE PLANS IS NOT GUARANTEED AS TO ACCURACY OR COMPLETENESS. AT LEAST 3 DAYS PRIOR TO BEGINNING ANY WORK THE CONTRACTOR SHALL REQUEST A FIELD UTILITY LOCATE THE CONTRACTOR SHALL COMPARE THE FIELD-MARKED LOCATIONS WITH THESE PROJECT PLANS AND NOTIFY THE ENGINEER OF ANY ANTICIPATED PROBLEMS OR NEED FOR CONTRACT CHANGES. IT IS THE CONTRACTOR'S RESPONSIBILITY TO EXCAVATE OR CAUSE THE UTILITY OWNER TO EXCAVATE FOR THE PURPOSE OF DETERMINING EXACT ELEVATIONS OR LOCATIONS AT UTILITY CROSSINGS AND OTHER CRITICAL LOCATIONS WELL IN ADVANCE OF THE WORK UNDER THIS CONTRACT.
6. CONTRACTOR TO HAVE UTILITIES LOCATED AND NOTIFY THE ENGINEER AND UTILITY OWNER OF ANY THAT REQUIRE RE-LOCATION AS PART OF THE EFFORT DEFINED HEREIN.
7. CONTRACTOR TO VERIFY ALL INFORMATION CONTAINED HEREIN AND NOTIFY OWNER AND / OR ENGINEER IMMEDIATELY IN THE EVENT THAT DISCREPANCIES BASED ON FIELD OBSERVATION ARE IDENTIFIED.
8. CONTRACTOR TO COORDINATE WITH OWNER TO ENSURE THAT ALL APPLICABLE CONSTRUCTION PERMITS ARE IN HAND PRIOR TO COMMENCEMENT OF WORK.
9. NO SUBSURFACE DATA HAS BEEN PROVIDED TO ENGINEER AS PART OF THIS EFFORT. CONTRACTOR TO REMOVE ALL UNSUITABLE MATERIAL UNDER WITHIN AREA TO BE IMPROVED TO A DEPTH OF 2 FT BELOW EXISTING GRADE AND REPLACE AS REQUIRED WITH MATERIAL MEETING SCDOT SPECIFICATIONS. PLACEMENT OF GEOTEXTILE FABRIC UNDERLAYMENT MAY BE REQUIRED.
10. IF THE CONTRACTOR DAMAGES ANY EXISTING UTILITIES AND FACILITIES DURING CONSTRUCTION, HE SHALL, AT HIS OWN EXPENSE REPAIR OR REPLACE THEM TO THEIR ORIGINAL CONDITION AND QUALITY, AS APPROVED BY THE ENGINEER.
11. THE CONTRACTOR SHALL MAINTAIN FIELD "AS-BUILT" DRAWINGS AND SHALL MEASURE AND SHOW LOCATION AND INVERT ELEVATIONS OF ALL IMPROVEMENTS. CONTRACTOR SHALL DELIVER THE "AS-BUILT" DRAWINGS TO ENGINEER PRIOR TO FINAL PAYMENT RELEASE.
12. WHEN CONSTRUCTION INVOLVES THE REMOVAL OF FENCES, POLES, SIDEWALKS, DRIVEWAYS, TEMPORARY OR FIXED STRUCTURES, THE CONTRACTOR AT HIS EXPENSE SHALL PROVIDE FOR TEMPORARY SERVICE OR CONTAINMENT TO THE AFFECTED PROPERTY, AND SHALL REPLACE SUCH ITEMS WITH SIMILAR OR BETTER MATERIALS AS SOON AS PRACTICAL OR AS DIRECTED BY THE ENGINEER FOLLOWING PIPE INSTALLATION.
13. PEDESTRIAN AND LOCAL VEHICULAR TRAFFIC SHALL BE MAINTAINED AT ALL TIMES DURING CONSTRUCTION SAFETY DEVICES AND FLAG MEN WILL BE PROVIDED BY THE CONTRACTOR AT HIS EXPENSE. WRITTEN PERMISSION TO CLOSE THE CONSTRUCTION AREA TO TRAFFIC MUST BE OBTAINED FROM THE APPROPRIATE GOVERNMENT AGENCY PRIOR TO THE CLOSING.
14. CONTRACTOR MUST OBTAIN WRITTEN PERMISSION FROM THE PROPERTY OWNERS BEFORE OPEN CUTTING CONCRETE OR ASPHALT DRIVEWAYS.
15. CONTRACTOR SHALL PERFORM CONSTRUCTION IN A MANNER THAT WILL ALLOW VEHICULAR ACCESS TO EACH HOME OR BUSINESS DURING CONSTRUCTION.
16. ALL CONSTRUCTION STAKING SHALL BE BY THE CONTRACTOR, AT HIS EXPENSE.
17. NO WORK SHOULD BE PERFORMED WITHIN SCDOT RIGHT OF WAY WITHOUT ENCROACHMENT PERMIT.
18. ALL WORK WITHIN SCDOT RIGHT OF WAY TO BE PERFORMED IN ACCORDANCE WITH SCDOT STANDARD SPECIFICATIONS FOR HIGHWAY CONSTRUCTION, LATEST EDITION.
19. CONTRACTOR TO SUBMIT A TRAFFIC MAINTENANCE PLAN FOR SCDOT APPROVAL PRIOR TO CONSTRUCTION (AS APPLICABLE) THAT IS PREPARED CONSISTENTLY WITH SCDOT STANDARD DRAWING 610-005-00 OR 610-025-00 (AS APPLICABLE AND AS REQUIRED BY SCDOT).
20. CONTRACTOR TO UTILIZE TRENCH BOX OR OTHER APPROVED SHORING METHOD FOR ALL EXCAVATIONS. CONTRACTOR SHALL CONFORM TO THE REQUIREMENTS OF THE DEPARTMENT OF LABOR'S OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION RULES AND REGULATIONS. PARTICULAR ATTENTION MUST BE PAID TO THE CONSTRUCTION STANDARDS FOR EXCAVATIONS, 29 CFR PART 1926, SUBPART P.
21. CONTOUR INTERVAL IS 1 FT.
22. PLAN OUTLINED HEREIN DOES NOT RESULT IN ANY INCREASE IN STORM WATER RUNOFF RATE TO THE SCDOT RIGHT OF WAY.

WASTEWATER CONSTRUCTION

1. SEWER LINE CONSTRUCTION SHALL CONFORM TO APPLICABLE SC-DHEC STANDARDS AND SPECIFICATIONS.
2. ENGINEER IN CONJUNCTION WITH DHEC PERMITTING, AS REQUIRED, WILL BE RESPONSIBLE FOR INSPECTION OF SEWER SYSTEM CONSTRUCTION.
3. ALL UTILITIES SHOWN ARE APPROXIMATE LOCATIONS. THE CONTRACTOR IS RESPONSIBLE FOR NOTIFICATION OF ALL UTILITY OWNERS AND FOR FIELD VERIFICATION OF BOTH HORIZONTAL AND VERTICAL LOCATIONS PRIOR TO COMMENCING CONSTRUCTION. ANY DAMAGES TO EXISTING UTILITIES DUE TO THIS CONSTRUCTION SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR.
4. CONTRACTOR TO NOTIFY THE PROJECT ENGINEER IF CONFLICTS WITH EXISTING STRUCTURES REQUIRE THAT PROPOSED UTILITIES BE RELOCATED.
5. THE CONTRACTOR MUST NOTIFY ENGINEER FORTY-EIGHT (48) HOURS PRIOR TO ANY CONSTRUCTION, INSPECTION OR TESTING OF SEWER SYSTEM CONSTRUCTION.
6. PIPE, FITTINGS, VALVES AND APPURTENANCES FOR SEWER LINES SHALL BE DESIGNED IN ACCORDANCE WITH TYPICAL INDUSTRY AND AWWA STANDARDS. MANUFACTURER DETAILS AND SPECIFICATIONS SHALL BE SUBMITTED TO THE OWNER/ENGINEER FOR PRE-APPROVAL.
7. CONTRACTOR SHALL INSTALL MECHANICAL RESTRAINTS ON ALL BENDS, PLUGS AND TEES, 2" OR LARGER, ON SANITARY SEWER FORCE MAINS.
8. THE CONTRACTOR SHALL CUT AND PATCH EXISTING PAVEMENT AS REQUIRED FOR THE INSTALLATION OF UTILITY LINES.
9. PUMP STATION SUBMERSIBLE WASTEWATER GRINDER PUMP AND ALL ASSOCIATED PUMP STATION APPURTENANCES SHALL BE DESIGNED AND CONSTRUCTED IN ACCORDANCE WITH TYPICAL INDUSTRY AND AWWA STANDARDS.
10. MANUFACTURER DETAILS AND SPECIFICATIONS FOR ALL PUMPS, PUMP MOTORS, WET-CELL, ACCESS DESIGN AND HARDWARE, MOUNTING FRAME AND GUILDS, LIQUID LEVEL SENSORS, CONTROL PANEL AND ASSOCIATED ELECTRICAL APPURTENANCES SHALL BE SUBMITTED TO OWNER/ENGINEER FOR PRE-APPROVAL.
11. AFTER INSTALLATION, ALL PUMPS, VALVES, AND OTHER APPURTENANCES SHALL BE TESTED FOR 2 HOURS AT THE WORKING PRESSURE CORRESPONDING TO THE CLASS OF PIPE, UNLESS A DIFFERENT TEST PRESSURE IS SPECIFIED. IF ANY POINT PROVES TO BE DEFECTIVE, IT SHALL BE REPAIRED TO THE SATISFACTION OF THE OWNER/ENGINEER.
12. AFTER INSTALLATION, ALL PUMP CONTROLS AND ELECTRICAL APPURTENANCES SHALL BE TESTED PER MANUFACTURER'S GUIDELINES. TESTING SHALL BE COMPLETED AND CERTIFIED BY CONTRACTOR IN THE PRESENCE OF OWNER/ENGINEER.

