BID & SPECIFICATIONS PACKAGE

UPGRADES TO CHESTNUT ROAD PUMP STATION
DDC P/N 14947E

Prepared for

THE CITY OF MYRTLE BEACH

HORRY COUNTY, SOUTH CAROLINA

November 2015

DDC ENGINEERS®

1298 Professional Drive
Myrtle Beach, SC 29577
(843) 692-3200
(843) 692-3210

#3

To: All Prospective Bidders

From: DDC Engineers, Inc.

Date: November, 2015

We would like to take this opportunity to point out one especially critical provision of the construction contract documents, the bidder's representation.

Your careful reading of the bidder's representation is imperative because by signing and submitting it with your bid figure, you will be representing to the Owner that 1) your detailed examination of the drawings and specifications has turned up no ambiguities which need clarification, 2) only authorized data have been used to arrive at your bid figure, and 3) the experience and capabilities of your firm, your workmen and your subcontractors are particularly well-suited to the construction of this type of project.

Please note that each of your subcontractors must also submit a signed copy of the bidder's representation before the Owner can award the contract.

If you find that you are unable to sign this representation because you believe the drawings or specifications are inadequate or erroneous in some way, please notify us at once so that corrective action can be taken. Similarly, if your bid figure is affected by information not contained in the construction contract documents, contact us immediately before submitting your bid.

Also, we would like to point out that there will be a pre-bid site meeting at the Chestnut Road pump station site on Tuesday, December 01, 2015 at 10:00am.

UPGRADES TO CHESTNUT ROAD PUMP STATION

for

The City of Myrtle Beach, South Carolina

DIVISION 0 CONTRACT INFORMATION & DOCUMENTS

DIVISION 0

CONTRACT INFORMATION
&
DOCUMENTS

SECTION 0100

NOTICE TO BIDDERS

Upgrades to Chestnut Road Pump Station
DDC P/N 14947E

Owner: City of Myrtle Beach
Post Office Drawer 2468
Myrtle Beach, South Carolina 29578

Engineer: DDC Engineers, Inc.
1298 Professional Drive
Myrtle Beach, SC 29577

Date: November 16, 2015

Interested parties are invited to submit sealed bids to the Owner at the City of Myrtle Beach Public Works Department Administration Building Conference Room located at 3210 Mr. Joe White Avenue in the City of Myrtle Beach, South Carolina before 2:00 p.m. local time on Thursday, December 10, 2015.

The Project consists of the demolition of the existing Chestnut Pump Station building, removal of existing pumps, controls, etc. and the restoration of an existing wetwell/drywell, the construction of a new concrete block control room building, installation of new pumps, controls and electrical work at the existing Chestnut Pump Station site, located north of Myrtle Beach.

Bidders shall comply with the requirements set forth in Section 0200 - Instruction to Bidders.

Bid documents may be obtained from the office of the Engineer, upon payment of a non-refundable fee, in the amount of $150.00 per set. Documents can only be obtained at the office of the Engineer.

Bidders shall include bid security in the sum of no less than five percent (5%) of the bid price.

Questions should be submitted in writing not less than three (3) days prior to bid date. All interpretations, clarifications, or changes will be made in the form of a written Addenda. See 3.04.D., page 0200-4.

Refer to other bidding requirements described in Document 0200 - Instructions to Bidders.

Bidders are required to submit their bid on the Bid Form provided. Bidders may not supplement this form unless otherwise directed.

The Owner reserves the right to accept or reject any or all bids, waive informalities and irregularities, negotiate terms and conditions, and select bid that best meets the needs of the Owner. Lowest bid may not prevail. Award of the bid will be based on the bid prices, references, past performance of bidder and any proposed subcontractor with projects of comparable scope, complexity, and time constraints.

Questions shall be submitted in writing to: DDC Engineers, Inc. 1298 Professional Drive, Myrtle Beach, SC 29577 (843) 692-3200. A copy of any response will be provided to all parties requesting a copy of the bid package.

END OF SECTION

SECTION 0200

INSTRUCTIONS TO BIDDERS

SECTION 0200

INSTRUCTIONS TO BIDDERS

1. SUMMARY

1.01 DOCUMENT INCLUDES:

2.0 Invitation
1. Bid Submission
2. Work Identified in the Contract Documents
3. Contract Time and Liquidated Damages

3.0 Bid Documents and Contract Documents
1. Definitions
2. Availability
3. Examination
4. Queries/Addenda
5. Product/System Substitutions
6. Contract Documents

4.0 Site Assessment
1. Site Examination

5.0 Qualifications
1. Evidence of Qualifications
2. Subcontractors/Suppliers/Others

6.0 Bid Submission
1. Submission Procedure
2. Bid Ineligibility

7.0 Bid Enclosures/Requirements
1. Security Deposit
2. Performance Assurance
3. Bid Form Requirements
4. Bid Form Signature

8.0 Offer Acceptance/Rejection
1. Duration of Offer
2. Acceptance of Offer

1.02 RELATED DOCUMENTS

A. Document 0100 - Notice to Bidders

B. Document 0300 - Bid Forms

C. Document 0550 - General Provisions

D. Document 0650 - Engineer's Supplementary Conditions

E. Document 0700 - Contract Forms

2. INVITATION

2.01 BID SUBMISSION

A. Bids will be received by the City of Myrtle Beach (herein called the "Owner"), at the City of Myrtle Beach Public Works Department Administration Building Conference Room located at 3210 Mr. Joe White Avenue in the City of Myrtle Beach until 2:00pm local time Thursday, December 10, 2015 at which time they will be publicly opened and read aloud.

B. Bids submitted after the time and date set for the receipt will be returned to the Bidder unopened.

C. Amendments to the submitted offer will be permitted if received in writing prior to Bid closing and if signed by the same party or parties who signed and sealed the original bid.

2.02 WORK IDENTIFIED IN THE CONTRACT DOCUMENTS

A. The work includes all work described in the Contract Documents.

B. Locations: Chestnut Road Pump Station.

C. The Owner reserves the right to reject any and/or all Bids.

2.03 CONTRACT TIME AND LIQUIDATED DAMAGES

A. The Contractor shall complete all work within the project within 120 consecutive calendar days. Liquidated damages of $2,500 per day will be assessed for each consecutive calendar day worked after the completion date.

3. BID DOCUMENTS AND CONTRACT DOCUMENTS

3.01 DEFINITIONS

A. Bid Documents: Contract Documents, Bid Forms, any Supplements to Bid Forms, and Bid Securities identified herein.

B. Contract Documents: Defined in the Agreement Form.

C. Bid: Act of submitting a sealed offer.

D. Bid Price: Total cost to perform the work submitted by the Bidder in the Bid Form.

3.02 AVAILABILITY

A. Bid Documents may be obtained at the office of the Engineer located at 1298 Professional Drive, Myrtle Beach, South Carolina 29577.

B. Bid Documents can be obtained by Bidders upon payment of $150.00 by cash or certified check. Such payment is non-refundable.

C. Bid Documents are made available only for the purpose of submitting a bid for this project.

3.03 EXAMINATION

A. Each Bidder must satisfy themselves of the accuracy of the estimated quantities in the Bid Schedule by examination of the site, a review of the drawings, and by reading and being thoroughly familiar with the Contract Documents, including Addenda. The failure or omission of any Bidder to do any of the foregoing shall in no way relieve any Bidder from any obligation in respect to its Bid.

B. Bid Documents may be viewed at the office of the Engineer.

C. Upon receipt of Bid Documents, verify that documents are complete. Notify Engineer should the documents be incomplete.

D. Immediately notify the Engineer upon finding discrepancies or omissions in the Bid documents.

3.04 QUERIES/ADDENDA

A. Direct questions in writing only to: DDC Engineers, Inc., 1298 Professional Drive, Myrtle Beach, South Carolina 29577, (843) 692-3200.

B. Addenda may be issued during the Bidding period. All Addenda shall become part of the Contract Documents. Include any resultant cost adjustments in the Bid Price.

C. Verbal instructions or comments are not binding on any party.

D. Clarifications requested by Bidders must be in writing not less than three (3) days before time set for receipt of Bids. The reply will be in the form of an Addendum, a copy of which will be forwarded to known recipients.

3.05 PRODUCT/SYSTEM SUBSTITUTIONS

A. Where the Bid Documents stipulate a particular product/system, substitutions will be considered unless otherwise stated in the Contract Documents.

B. Bidders shall include in their Bid, any changes required in the Work to accommodate such substitutions. A later claim by the Bidder for an addition to the Contract Time or Contract Price because of changes in Work necessitated by use of substitutions shall not be approved.

C. See Section 01631 – Substitutions, for additional conditions and requirements.

3.06 CONTRACT DOCUMENTS

A. The Contract Documents contain the provisions required for the completion of the work. Information obtained from an officer, agent, or employee of the Owner or any other person shall not affect the risks or obligations assumed by the Contractor or relieve him from fulfilling any of the conditions of the contract.

4. SITE ASSESSMENT

4.01 SITE EXAMINATION

A. The Bidder is responsible to inspect the project site before submitting a Bid in order to become familiar with site and soil conditions.

B. The project site is open for examination by Bidders.

5. QUALIFICATIONS

5.01 EVIDENCE OF QUALIFICATIONS

A. Bidders must be licensed to perform work in the State of South Carolina and shall include their license number on the Bid Documents.

B. Evaluation of Bidders will concentrate on their experience with projects of comparable scope and complexity. Bidders shall indicate prior projects that exhibit these qualities in their statement of experience. Additional attachments exhibiting such experience must be included with the bid.

C. The successful Bidder must complete a minimum of 60% of the work with their own forces. The remainder of the work may be performed by subcontractor(s). All subcontractors must be approved by the Owner prior to award of the bid.

5.02 SUBCONTRACTORS/SUPPLIERS/OTHERS

A. The Owner reserves the right to reject a proposed Subcontractor.

B. Information on subcontractors shall be furnished by the Bidder to the Owner as required in the Contract Documents.

C. All Subcontractors must be approved in writing by the Owner prior to the performance of any work.

6. BID SUBMISSION

6.01 SUBMISSION PROCEDURE

A. Each Bid must be submitted in a sealed envelope, addressed to the City of Myrtle Beach at P.O. Drawer 2468, Myrtle Beach, South Carolina 29578. If delivered by hand, the Bid shall be delivered to the City of Myrtle Public Works Department Administration Building Conference Room at 3210 Mr. Joe White Avenue, Myrtle Beach, South Carolina by 2:00pm on Thursday, December 10, 2015.

B. Each sealed envelope containing a Bid must be plainly marked on the outside as Bid for the City of Myrtle Beach, South Carolina and the envelope should bear on the outside the name of the Bidder, his address, his bidder's license number and the name of the project for which the Bid is submitted.

C. Bidders shall be solely responsible for the delivery of their Bids in the manner and time prescribed.

D. Bids mailed shall be enclosed in another envelope. Insert the closed and sealed Bid Form in the envelope to be mailed.

E. A summary of submitted Bids will be made available to all Bidders within five (5) business days following the Bid opening by the Engineer.

6.02 BID INELIGIBILITY

A. Bids that are incomplete, unsigned, improperly signed or sealed, conditional, illegible, obscure, contain arithmetical errors, erasures, alterations, or irregularities of any kind, will, at the discretion of the Owner, be declared non-responsive.

7. BID ENCLOSURES/REQUIREMENTS

7.01 SECURITY DEPOSIT

A. Bids shall be accompanied by a security deposit as follows:

1. Bid Bond of a sum no less than five (5%) percent of the Bid Price. (Include Power of Attorney).

2. Certified check in the amount of five (5%) percent of the Bid Price.

3. Other types of security may be allowed if pre-approved in writing by the Owner.

B. Bids shall be submitted on the required form and shall include: Bid Proposal, Non-collusion Affidavit, Bidder's Representation, Statement of License Certificate, Statement of Experience of the Bidder, Project Superintendent, List of Subcontractors, and Bid Bond.

C. The Bid Bond shall name the Owner as obliged, and be signed and sealed by the Contractor as principal as well as the Surety.

D. Bid securities will be returned to all Bidders upon receipt by the Owner of the required Insurance, Performance, and Payment Bonds from the successful Bidder.

E. Include the cost of Bid security in the Bid Price.

F. All Bid securities will be returned to the respective Bidders.

G. If no contract is awarded, all Bid securities will be returned.

7.02 PERFORMANCE ASSURANCE

A. Successful Bidder: Shall provide the stipulated insurance, along with the Performance and Payment Bonds as described in the Contract Documents.

B. Include the cost of bonding in the Bid Price.

C. Attorneys-in-Fact who sign bid bonds or payment bonds and performance bonds must file with each bond a certified and effective dated copy of their power of attorney.

7.03 BID FORM REQUIREMENTS

A. Complete all requested information in the Bid Form and Appendices.

B. All Bids shall be submitted on the required Bid Form. All blank spaces for Bid prices must be filled in, in ink or typewritten, and the Bid Form must be fully completed and executed when submitted. Only one copy of the Bid Form is required.

C. Bidders must satisfy themselves of the accuracy of the Contract Documents by thorough examination of the site and a review of the proposed project phasing. After Bids have been submitted, the Bidder shall not assert that there was a misunderstanding concerning the scope or nature of the Work.

7.04 BID FORM SIGNATURE

A. The Bid Form shall be signed by the Bidder, as follows:

1. Sole Proprietorship: Signature of sole proprietor in the presence of a witness who will also sign. Insert the words "Sole Proprietor" under the signature. Affix seal.

2. Partnership: Signature of all partners in the presence of a witness who will also sign. Insert the word "Partner" under each signature. Affix seal to each signature.

3. Corporation: Signature of a duly authorized signing officer(s) in their normal signatures. Insert the officer's capacity in which the signing officer acts under each signature. Affix the corporate seal. If the Bid is signed by officials other than the President and Secretary of the company, or the President/Secretary/Treasurer of the company, a copy of the by-law resolution of the Board of Directors authorizing them to do so must also be submitted with the Bid Form.

4. Joint Venture: Each party of the joint venture shall execute the Bid Form under their respective seals in a manner appropriate to such party as described above, similar to the requirements of a Partnership.

8. OFFER ACCEPTANCE/REJECTION

8.01 DURATION OF OFFER

A. Bids shall remain irrevocable for a period of sixty (60) days after the Bid closing date.

B. Should there be reasons why the contract cannot be awarded within the specified period, the time may be extended by mutual agreement between the Owner and the successful Bidder.

8.02 ACCEPTANCE OF BID

A. The Owner reserves the right to accept or reject any or all bids, waive informalities and irregularities, negotiate terms and conditions, and select bid that best meets the needs of the Owner. Lowest bid may not prevail. Award of the bid will be based on the bid price, references, past performance of bidder and any proposed subcontractor with projects of comparable scope, complexity, and time constraints.

B. The Owner may make such investigations as he deems necessary to determine the ability of the Bidder to perform the Work, and the Bidder shall furnish to the Owner all such information and data for this purpose as the Owner may request. The Owner reserves the right to reject any Bid if the evidence submitted by, or investigation of, such Bidder fails to satisfy the Owner that such Bidder is properly qualified to carry out the obligations of the Agreement and to complete the Work contemplated therein.

C. The party to whom the contract is awarded will be required to execute the Agreement and obtain the Performance Bond, Payment Bond, and Certificate of Insurance within ten (10) calendar days from the date when Notice of Award is delivered to the Bidder. The Notice of Award shall be accompanied by the necessary Agreement, Bond forms, and Certificate of Insurance. In case of failure of the Bidder to execute the Agreement, the Owner may at his option consider the Bidder in default, in which case the Bid Bond accompanying the proposal shall become the property of the Owner.

D. The Owner within ten (10) days of receipt of acceptable Performance Bond, Payment Bond, Certificate of Insurance and Agreement signed by the party to whom the Agreement was awarded shall sign the Agreement and return to such party an executed duplicate of the Agreement. Should the Owner not execute the Agreement within such period, the Bidder may by written notice withdraw his signed Agreement. Such notice of withdrawal shall be effective upon receipt of the notice by the Owner.

END OF SECTION

SECTION 0300

BID FORMS

SECTION 00300 - COMMENTS ABOUT THE PROJECT

The City of Myrtle Beach is proposing

The Bidder is to include in his proposal all work to perform the listed items and other work reasonably intended and shown on the construction drawings.

The Bidder should consider the following information in making his bid:

1. The information on the construction drawings shown has been compiled from various maps and markings by various utility companies. Actual locations of the utilities shown may vary. The contractor shall excavate (pot hole) all existing utilities prior to the start of construction of the pipe line to determine location and elevation of each utility.
2. Unit prices shall include, but not be limited to, all work proposed, demolition, bypass pumping, dewatering operations, sheeting, well pointing, pedestrian control, signage, barricades, traffic control, silt fencing, erosion control, and temporary piping.
3. Contractor must insure that residents are not disturbed by the noise generated from the construction operations. Any noise reduction techniques shall be included in the bid. If any noise complaints are received, the Contractor will be required to change noise reduction and/or construction methods immediately.
4. All materials that are removed during construction of the project must be disposed of appropriately by the Contractor as part of the contract price.
5. Once the project is initiated, it must be carried to completion in an expeditious manner in order to minimize the period of disturbance to the environment.
6. All necessary measures must be taken to prevent oil, tar, trash, debris and other pollutants from entering the adjacent waters during construction.
7. The Contractor must implement best management practices that will minimize erosion and migration of sediments on and off the project site during and after construction. These practices should include the use of appropriate grading and sloping techniques, mulches, silt fences, or other devices capable of preventing erosion, migration of sediments and bank failure. All disturbed land surfaces and sloped areas must be stabilized and sloped.
8. The Contractor shall maintain existing storm drainage flows throughout the construction of the drainage improvements. This may require the Contractor to install some temporary piping or install pumps to maintain storm drainage flows during the installation of the upstream drainage improvements. This cost shall be included in the unit pipe prices.
9. The proposed pipe prices shall include all sheeting, dewatering, excavation trenching, bedding and backfill compaction, etc.
10. The Contractor is responsible for all bypass sewage pumping for the duration of the construction of the project.
11. The average sewage flows into the existing station are estimated to be up to 3,000 gpm at 60 feet of TDH. Contractor to have at least a duplex pumping system with quiet or silent pumps for noise.
12. The Contractor to deliver all material slated to be salvaged to the City of Myrtle Beach Public Works Sewage shop on Mr. Joe White Avenue.
13. The existing odor control system (Zaboc System) is to remain at the site and to be refurbished by the City of Myrtle Beach.

END OF SECTION

SECTION 0300

BID FORMS

UPGRADES TO CHESTNUT ROAD PUMP STATION
for the
City of Myrtle Beach

BIDDER'S REPRESENTATION

By the act of submitting a bid for the proposed contract, the Bidder represents that:

1. The Bidder and all subcontractors the Bidder intends to use have carefully and thoroughly reviewed the Contract Documents and have found them complete and free from ambiguities and sufficient for the purpose intended; and

2. The Bidder and all workmen, employees and subcontractors the Bidder intends to use are skilled and experienced in the type of work represented by the Contract Documents; and

3. Neither the Bidder nor any of the Bidder's employees, agents, intended suppliers or subcontractors have relied upon any verbal representations, of the Owner, or the Owner's employees or agents including architects, engineers or consultants, in assembling the bid; and

4. The bid figure is based solely upon the Contract Documents and not upon any other oral or written representation.

By: _____

Title: _____

Subscribed and sworn to before me

this _____ day of _____, 20____.

My commission expires on: _____.

NON-COLLUSION AFFIDAVIT OF PRIME BIDDER

State of South Carolina)
County of Horry)

_____

being first duly sworn, deposes and says that:

(1) He is _____ of _____, the Bidder that has submitted the attached Bid:

(2) He is fully informed respecting the preparation and contents of the attached Bid and of all pertinent circumstances respecting such Bid:

(3) Such Bid is genuine and is not a collusive or sham Bid;

(4) Neither the said Bidder nor any of its officers, partners, owners, agents, representatives, employees or parties in interest, including this affidavit, has in any way colluded, conspired, connived or agreed, directly or indirectly with any other Bidder, firm or person to submit a collusive or sham Bid in connection with the Contract for which the attached Bid has been submitted or to refrain from bidding in connection with such Contract, or has in any manner, directly or indirectly, sought by agreement or collusion or communication or conference with any other Bidder, firm or person to fix the price or prices in the attached Bid or of any other Bidder, or to fix any overhead, profit or cost element of the Bid price or the Bid price of any other Bidder, or to secure through any collusion, conspiracy, connivance or unlawful agreement any advantage against the Owners or any person interested in the proposed Contract; and

(5) The price or prices quoted in the attached Bid are fair and proper and are not tainted by any collusion, conspiracy, connivance or unlawful agreement on the part of the Bidder or any of its agents, representatives, owners, employees, or parties in interest, including this affidavit

(Signed) _____

_____
(Title)

Subscribed and sworn to before me this _____ day of _____, 20___.

_____. My commission expires

_____ on:_____(Title)_____

STATEMENT OF LICENSE CERTIFICATE

EACH CONTRACTOR BIDDING SHALL FILL IN AND SIGN THE FOLLOWING:

This is to certify that _____ have fully complied with all the requirements of the South Carolina Licensing Board for Contractors. The Contractor's license number and date of registration shall appear on the envelope containing the bid, otherwise the bid will not be considered.

_____ was issued Certificate No. _____

on _____, 20____ by the State Board for licensing General Contractors.

Signed: _____

Title: _____

STATEMENT OF EXPERIENCE OF THE BIDDER

The bidder is requested to state below what work of similar scope and complexity he has completed, and to give references that will enable the Owner to judge his experience, skill and business standing and his ability to conduct the work as completely and as rapidly as required under the terms of the contract.

	Project and Location	Reference
1)	_____	_____
	_____	_____
2)	_____	_____
	_____	_____
3)	_____	_____
	_____	_____
4)	_____	_____
	_____	_____
5)	_____	_____
	_____	_____
6)	_____	_____
	_____	_____
7)	_____	_____
	_____	_____

Dated: _____ Bidder: _____

Signed: _____

Title: _____

PROJECT SUPERINTENDENCE

The Undersigned states that the following employee will assume the role of project superintendent representing the Contractor on this Project. The undersigned further states that this individual, whose qualifications are presented below (attach additional sheets, if necessary), will have authority to speak for the Contractor and will not be removed from this Project or temporarily substituted for on this Project without the written consent of the Owner and Project Engineer.

Project Superintendent's Name: _____

Years of Experience: _____

Brief but Complete Description of Experience Relevant to this Project: _____

References from Owners where work of similar scope, and complexity has been accomplished under Proposed Superintendent's direct supervision.

1.	2.	3.	4.	5.
(Phone)	(Phone)	(Phone)	(Phone)	(Phone)

"I consent to the disclosure of my qualifications and other applicable personal data for the purpose of evaluating proposals under this solicitation."

_____ _____
Employee's Signature Date

"I certify to this employee's role in this Project and that the qualifications presented herein are accurate, complete and current."

Bidder: _____ Date:

Signed: _____

Title: _____

LIST OF SUBCONTRACTORS

The undersigned states that the following is a full and complete list of the proposed subcontractors on this Project and the class of work to be performed by each, and that such list will not be added to nor altered without written consent of the Owner.

	Subcontractor and Address	Class of Work to be Performed
1)		
2)		
3)		
4)		
5)		
6)		
7)		

Dated: _____ Bidder: _____

Signed: _____

Title: _____

BID BOND

KNOW ALL MEN BY THESE PRESENTS, that we the undersigned,

_____ as PRINCIPAL, and

_____ as SURETY are hereby held and firmly bound unto

_____, as OWNER, in the penal sum of _____, for the payment of which, well and truly to be made, we hereby jointly and severally bind ourselves, successors and assigns.

THE CONDITION OF THE ABOVE OBLIGATION IS SUCH, that Whereas the Principal has submitted to the City of Myrtle Beach a certain BID, attached hereto and hereby made a part hereof to enter into a contract in writing, for the

Upgrades to Chestnut Road Pump Station

NOW, THEREFORE,

(a) If said BID shall be rejected, or

(b) If said BID shall be accepted and the Principal shall execute and deliver a contract in the Form of Contract attached hereto (properly completed in accordance with said BID) and shall furnish a BOND for his faithful performance of said contract, and for the payment of all persons performing labor or furnishing materials in connection therewith, and shall in all other respects perform the agreement created by the acceptance of said BID, then this obligation shall be void, otherwise the same shall remain in force and effect; it being expressly understood and agreed that the liability of the Surety for any and all claims hereunder shall, in no event, exceed the penal amount of this obligation as herein stated.

THE SURETY, for value received, hereby stipulates and agrees that the obligations of said Surety and its BOND shall be in no way impaired or affected by any extension of the time within which the OWNER may accept such BID; and said Surety does hereby waive notice of any such extension.

IN WITNESS WHEREOF, the Principal and the Surety have hereunto set their hands and seals, and such of them as are corporations have caused their corporate seals to be hereto affixed and these presents to be signed by their proper officers, the day and year first set forth above.

_____(L.S.)
Principal

_____
Surety

By: _____

Date: _____

IMPORTANT - Surety companies executing BONDS must appear on the Treasury Department's most current list (Circular 570 as amended) and be authorized to transact business in the state where the project is located.

SECTION 0300

BID PROPOSAL

Proposal of _____ (hereinafter called "BIDDER"), organized and existing under the laws of the State of _____ doing business as _____*.

To the City of Myrtle Beach, South Carolina, (hereinafter called "OWNER").

In compliance with your Advertisement for Bids, BIDDER hereby proposes to perform all WORK for the construction of the upgrades to the Chestnut Road Pump Station, in strict accordance with the CONTRACT DOCUMENTS as outlined in this proposal, within the time set forth therein, and at the prices stated below.

By submission of this BID, each BIDDER certifies, and in the case of a joint BID each party thereto certifies as to his own organization, that this BID has been arrived at independently, without consultation, communication, or agreement as to any matter relating to this BID with any other BIDDER or with any competitor.

BIDDER hereby agrees to commence WORK under this contract on or before a date to be specified in the NOTICE TO PROCEED and to fully complete the PROJECT within the time constraints as set forth in Section 0200, Paragraph 2.03 - Contract Time and Liquidated Damages; Section 0650, Paragraph 1.12 - Project Schedule, and; as further stated herein. BIDDER further agrees to pay as liquidated damages, the sum of $2,500.00 for each consecutive calendar day thereafter as provided in Section 0200, Paragraph 2.03 and Section 0650, Paragraph 1.12.

BIDDER acknowledges receipt of the following ADDENDUM:

Addendum No. _____,	Dated: _____
Addendum No. _____,	Dated: _____
Addendum No. _____,	Dated: _____

*Insert "a corporation", "a partnership", or "an individual" as applicable.

BIDDER agrees to perform all the work described in the CONTRACT DOCUMENTS for the following total lump sum base bid amount of: $_____.

Total Lump Sum Base Bid (in words): _____.

SCHEDULE

Bidder agrees to perform all work described in the Contract Documents in keeping with the attached preliminary Project Schedule, including each phase of construction, as prepared by the bidder in keeping with Section 1310, Construction Schedules.

UNIT PRICES

Bidder shall provide Unit Prices, as outlined below with their bid.

PRICE SCHEDULE

UPGRADES TO CHESTNUT ROAD PUMP STATION

The unit quantities indicated in the construction documents are design estimates, and are not warranted to be accurate. It is the responsibility of the Contractor to verify all quantity take-offs, and to bid the work appropriately. Any discrepancy and resulting cost adjustments should be noted on the Bid Schedule.

NOTE: The undersigned hereby proposes to furnish all labor, equipment and materials. Bids shall include sales tax and all other applicable taxes and fees. Bid prices shall also include all utility work proposed, demolition, bypass pumping, dewatering operations, sheeting, well pointing, pedestrian control, signage, barricades, traffic control, silt fencing, and erosion control for the following proposal. The contractor must ensure that residents, condo guest, etc. are not disturbed by the noise generated from bypass sewage pumping operations, and any noise reduction techniques must be included in the bid prices. If any noise complaints are received the contractor will be required to change noise reduction, and/or construction methods immediately. All materials that are removed during the construction of the project must be disposed of appropriately by the contractor at the contractor's expense, or unless listed as a salvaged by The City of Myrtle Beach and must be included in the prices below. All flanged bolts and nuts to be stainless steel. All DIP lines and fitting to be sewer coat or approved equal.

Item	Description	Engr's Est.	Bid Qty	Unit	Unit Price	Amount
Upgrades to Chestnut Road Pump Station						
1.	Mobilization	1		LS	$	$
2.	Duplex Sewage Bypass Pumping System Complete, Pump, Force Main Connection, Piping, System Controls, etc. (quiet pumps)	1		LS	$	$
3.	Demolition of Existing Pump Station	1		LS	$	$
4.	Existing Wetwell and Drywell Rehab, Cleaning, Repairs, and Wetwell Lining System	1		LS	$	$
5.	Wetwell and Drywell Concrete Invert	1		LS	$	$
6.	Existing 48" Influent Line Concrete Slide to New Concrete Invert	1		LS	$	$
7.	Remove Existing Pump and Equipment, etc. to be Salvaged and Delivered to The City of Myrtle Beach	1		LS	$	$
8.	Construction of New 8" Block Building Complete. Includes foundation, slab, block building, roof, insulation, etc.	1		LS	$	$
9.	Furnish and Install Four (4) Self Priming Pumps with Motors Complete	4		EA	$	$

Item	Description	Engr's Est.	Bid Qty	Unit	Unit Price	Amount
10.	Furnish and Install 12" DIP Suction Pipes Complete with all Bends	4		EA	$	$
11.	Furnish and Install the DIP Discharge Pipe Complete (from Top of Pumps through Building Wall)	1		LS	$	$
12.	Furnish and Install VFD Control Panel Complete	1		LS	$	$
13.	Furnish and Install Electrical Service Complete	1		LS	$	$
14.	Water Service Complete	1		LS	$	$
15.	Furnish and Install 400 KW Generator Set Complete (Includes all Wiring Controls, and Conduits)	1		LS	$	$
16.	Furnish and Install Auto Transfer Switch Control Panel Complete (Includes all Wiring and Conduits)	1		LS	$	$
17.	Cut-in 16" x 16" Tee with 2-16" MJ-Plug Valves Complete	1		LS	$	$
18.	16" Class 350 DIP (Sewer Coat)	30		LF	$	$
19.	16" PVC – C905 PVC DR-25	50		LF	$	$
20.	16" MJ – Plug Valve with Box	1		EA	$	$
21.	Remove and Relocate 16" MJ Plug Valve with Box	1		EA	$	$
22.	16" MJ 45° Bend Restrained	4		EA	$	$
23.	16" MJ 90° Bend Restrained	1		EA	$	$
24.	16" x 16" MJ Tee Restrained	1		EA	$	$
25.	20" x 16" MJ Reducer Restrained	1		EA	$	$
26.	16" Flanged 90° Bend	1		EA	$	$
27.	16" MJ Long Sleeve Restrained	1		EA	$	$
28.	12" N-12 CPP Drainage Pipe	120		LF	$	$
29.	Turf Catch Basin Complete	8		EA	$	$
30.	Tie Into Existing Catch Basin	1		EA	$	$

Item	Description	Engr's Est.	Bid Qty	Unit	Unit Price	Amount
31.	16" Magnetic Meter with Vault Complete (Includes 16" Dresser Coupling Controller all Wiring to Control Panel and Power Service to Meter)	1		LS	$	$
32.	Furnish and Install Building Electrical System, Lighting Panel, and Transformer	1		LS	$	$
33.	Furnish and Install Building Fix Hoist Beam System Includes Two (2) -1½ Ton Chain Hoist (36 KS1 Steel)	1		LS	$	$
34.	Furnish and Install Pump Station Back-up Float System	1		EA	$	$
35.	Furnish and Install a ¾" Schedule 80 PVC Airline and Air Bell System	1		EA	$	$
36.	Self-Priming Pump Air Release Valves and Piping	4		EA	$	$
37.	18" Exhaust Fan with Thermostat Control	1		EA	$	$
38.	12" Exhaust Fan with Thermostat Control	1		EA	$	$
39.	4" Concrete Sidewalk	200		SQFT	$	$
40.	14 ft. x 6 ft. x 6" Concrete Pad for Generator Set	1		LS	$	$
41.	18 ft. x 8 ft. x 8" Concrete Pad Chemical Feed Tank	1		LS	$	$
42.	4" Concrete Pads	21		SQFT	$	$
43.	6" Concrete Pads	42		SQFT	$	$
44.	Existing Concrete Block Wall – Repair and Painting, Outside of Existing Pump Station Wall (Paint, Match Existing Color)	1		LS	$	$
45.	6" GABC Base Material	60		SYDS	$	$
46.	2" SCDOT Type "B" Asphalt	70		SYDS	$	$
47.	2" SCDOT Type "B" Overlay	450		SYDS	$	$
48.	Overlay Tie-In Milling	1		LS	$	$
49.	Pavement Markings	1		LS	$	$
50.	SCDOT Pavement Repair	35		LF	$	$

Item	Description	Engr's Est.	Bid Qty	Unit	Unit Price	Amount
51.	12" Emergency Pump Connect Complete (Included 16" x 12" Tee, 12" Plug Valve, Piping and Slab)	1		EA	$	$
52.	Connection into Existing 20' DIP Force Main	1		EA	$	$
53.	Replace Existing Landscaping	1		LS	$	$
54.	Abandon Existing 16" Gate Valves with Box	2		EA	$	$
					TOTAL:	

Total Amount:_____00/100 Dollars
In words

Respectfully submitted:

_____ _____
Signature Address

_____ _____
Title Date

_____
License Number (if applicable)

SEAL (if BID is by a corporation)

Attest: _____

END OF SECTION

First in Service

CITY OF MYRTLE BEACH

LOCAL VENDOR PREFERENCE

TO QUALIFY FOR LOCAL PREFERENCE FORM MUST BE SUBMITTED WITH BID

APPLICATION OF ELIGIBILITY TO QUALIFY FOR LOCAL VENDOR PREFERENCE WITHIN THE DEFINED BOUNDARIES: MYRTLE BEACH CITY LIMITS, HORRY COUNTY, NESA AREA (NESA area is comprised of Horry, Georgetown, Williamsburg, Florence, Marion, Darlington, Dillon, Chesterfield, and Marlboro Counties).

City of Myrtle Beach Business License: (To qualify for Local Vendor Preference vendor must have had a **City of Myrtle Beach Business License** a minimum of ninety (90) days prior to the request for bid/ proposal being made public)

City of MB Business License Number: _____ Date issued: _____

Complete all areas below. Incomplete forms may be rejected.

1. LEGAL NAME OF BUSINESS: _____

   Mailing Address: _____

   _____

   Physical Address: _____
   (To qualify vendor must have maintained a physical address and office as a principal place of business within the defined boundaries of the category sought for at least one (1) year, and during that time have had a majority of full-time employees, chief officers and managers regularly conducting work and business from this office.)

   _____

2. Year business was established in the City of Myrtle Beach / Horry County / NESA area:

   Year: _____ County: _____
   (Name of County)

****

Under penalty of perjury, the undersigned states that the foregoing statements are true and correct. The undersigned also acknowledges that any person, firm, corporation or entity intentionally submitting false information to the City in an attempt to qualify for local preference shall be prohibited from bidding on City of Myrtle Beach products and services for a period of one (1) year.

Authorized Signature: _____ Date: _____

Printed Name & Title: _____ Phone: _____

LOCAL VENDOR PREFERENCE continued

Bid Amount	Within City Limits	Within Horry County	Within NESA Area
Up to $5000.00	5% of Bid	4% of Bid	3% of Bid
$5001.00 to $10,000.00	$250.00 plus 4% of amount between $5001.00 and $10,000.00	$200.00 plus 3% of amount between $5001.00 and $10,000.00	$150.00 plus 2% of amount between $5001.00 and $10,000.00
$10,001.00 and up	$450.00 plus 3% of amount above $10,000.00 with the maxium being $2000.00, including the $450.00	$400.00 plus 2% of amount above $10,000.00 with the maxium being $1800.00, including the $400.00	$300.00 plus 1% of amount above $10,000.00 with the maxium being $1600.00, including the $300.00

If company/individual performs services on City property a Certificate of Insurance **must be** provided prior to commencement of work meeting requirements of the City.

The vendor must submit a copy of their Local Vendor Preference Certificate with their bid.

An eligible business shall maintain such status throughout the term of any contract with the City. Failure to maintain such status or to keep current on all fees and taxes owed the City shall be grounds to terminate the contract.

SECTION 0550

GENERAL PROVISIONS

SECTION 0550

CITY OF MYRTLE BEACH

DEPARTMENT OF PUBLIC WORKS

GENERAL PROVISIONS

I. REQUIREMENTS

A. Definitions

Whenever used in these General Provisions or in the other Contract Documents, the following terms shall have the meanings indicated which are applicable to both the singular and plural thereof:

1. "Directed", "permitted", "reviewed", "accepted", "approved", or words of similar import mean the direction, requirements, permission, approval, or acceptance of Engineer, or Owner, unless stated otherwise.

2. "As shown", "as indicated", "as detailed", or words of similar import refer to the Drawings unless stated otherwise.

3. "Addenda", -- Written or graphic instruments issued prior to the opening of Bids which clarify, correct, or change the Contract Documents.

4. "Agreement", -- The written agreement between the Owner and Contractor outlining the work to be performed, the Contract Time, and the Contract Price.

5. "Application for Payment", -- The Periodical Estimate for Partial Payment Form which is to be used by Contractor in requesting progress or final payment and which is to include such supporting documentation as is required by the Contract Documents. A copy of the form is included with these Contract Documents.

6. "Bid", -- The offer or proposal of the Bidder submitted on the prescribed form setting forth the prices for the work to be performed.

7. "Bonds", -- Bid, performances, and payment bonds and other acceptable instruments of security.

8. "Change Order", -- A written order to Contractor signed by Owner authorizing an addition, deletion, or revision in the work or an adjustment in the Contract Price or the Contract Time, issued on or after the effective date of the Agreement.

9. "Contract Price", -- The money payable by Owner to Contractor under the Contract Documents as stated in the Agreement (subject to the approximate quantities provisions in the Instructions to Bidders in the case of Unit Price Work).

10. "Contract Time", -- The number of days or the date stated in the Agreement for the completion of the Work.

11. "Contractor", -- The person, firm, or corporation with whom Owner have entered into the Agreement.

12. "Day", -- A calendar day of twenty-four hours measured from midnight to the next midnight.

13. "Defective", -- An adjective which when modifying the word Work refers to Work that is unsatisfactory, faulty, or deficient, or does not conform to the Contract Documents or does not meet the requirements of any inspection, reference standard, test, or approval referred to in the Contract Documents, or has been damaged prior to Engineer's recommendation of final payment.

14. "Drawings", -- The Drawings which show the character and scope of the work to be performed and which have been prepared or approved by engineer and are referred to in the Contract Documents.

15. "Effective Date of the Agreement", -- The date indicated in the Agreement on which it becomes effective, but if no such date is indicated it means the date on which the Agreement is signed and delivered by the last of the two parties to sign and deliver.

16. "Engineer", -- The Professional Engineering Firm representing the Owner.

17. "Field Order", -- A written order issued by Engineer which orders minor changes in the Work but which does not involve a change in the Contract Price or the Contract Time.

18. "Final Acceptance", -- The date when the construction of the project is complete in accordance with the Contract Documents so that the entire project can be utilized for the purposes for which it is intended and all monies due Contractor have been paid him in the final Application for Payment.

19. "General Requirements", -- Officially recognized materials and workmanship specifications of the Owner.

20. "Inspector", -- The engineering or technical inspector duly authorized or appointed by Engineer or by Owner limited to the particular duties entrusted to him.

21. "Major Equipment", -- The major equipment items listed by name in the Contract Documents which are to be furnished and installed under the Contract.

22. "Modification", -- (a) A written amendment of the Contract Documents signed by both parties, (b) a Change Order, or (c) a Field Order. A modification may only be issued after the effective date of the Agreement.

23. "Notice of Award", -- The written notice by Owner to the successful Bidder stating that upon compliance with the conditions precedent enumerated therein, and within the time specified, Owner will sign and deliver the Agreement.

24. "Notice to Proceed", -- A written notice given by Owner to Contractor, (with a copy to Engineer), fixing the date on which the Contract Time will commence to run and on which Contractor shall start to perform Contractor's obligation under the Contract Documents and the date on which all work scheduled under the Contract shall be completed.

25. "Owner", -- The City of Myrtle Beach, South Carolina.

26. "Project", -- The total construction of which the work to be provided under the Contract Documents may be the whole or a part, as indicated in the Contract Documents.

27. "Provide", -- As used in the Specifications means furnish and install.

28. "Shop Drawings", -- All drawings, diagrams, illustrations, schedules, and other data which are specifically prepared by or for Contractor to illustrate some portion of the Work and all illustrations, brochures, standard schedules, performance charts, instructions, diagrams, and other information prepared by a supplier and submitted by Contractor to illustrate material or equipment for some portion of the Work.

29. "Specifications", -- Those portions of the Contract Documents consisting of written technical descriptions of materials, equipment, construction systems, standards, and workmanship as applied to the Work and certain administrative details applicable thereto.

30. "Sub-Contractor", -- An individual, firm, or corporation having a direct contract with Contractor or with any other Sub-Contractor for the performance of a part of the work.

31. "Substantial Completion", -- The Work (or a specified part thereof) which has progressed to the point where, in the written opinion of Engineer, it is sufficiently complete, in accordance with the Contract Documents, so that the Work (or specified part) can be safely and effectively utilized by the Owner, without inconvenience or interruption, for the purpose for which it was intended. The terms "substantially complete" and "substantially completed", as applied to any Work, refer to Substantial Completion thereof.

32. "Supplier", -- A manufacturer, fabricator, supplier, distributor, materialman, or vendor.

33. "Work", -- The entire completed construction or the various separately identifiable parts thereof required to be furnished under the Contract Documents. Work is the result of performing services, furnishing labor, and furnishing and incorporating materials and equipment into the construction, all as required by the Contract Documents.

B. ABBREVIATIONS

Wherever abbreviations are used in this Contract Document, each such abbreviation shall have the following listed meaning:

UNIT OF MEASURE

CY Cubic Yard

Ft.	Feet
Lbs.	Pounds
M	One Thousand
MFBM	One Thousand Feet Board Measure
C	Centigrade
F	Fahrenheit
HP	Horsepower
KVA	Kilovolt Ampere
BTU	British Thermal Unit
LF	Linear Feet
SF	Square Feet
UNO	Unless Noted Otherwise
NIC	Not In Contract
ADBA	Also Doing Business As

TYPES AND UNITS

DI	Ductile Iron
PVC	Polyvinyl Chloride
HDPE	High Density Polyethylene
MJ	Mechanical Joint
B & S	Beel and Spigot
T & G	Tongue and Groove
SS	Single Strength
DS	Double Strength
VC	Vitrified Clay
RC	Reinforced Concrete
MH	Manhole
CB	Catchbasin
ES	Extra Strength

ORGANIZATIONS AND PUBLICATIONS

AASHO	American Association of State Highway Officials
ACI	American Concrete Institute
AIEE	American Institute of Electrical Engineers
AISC	American Institute of Steel Construction
ASA	American Standards Association, Inc.
ASME	American Society of Mechanical Engineers
ASTM	American Society for Testing and Materials
AWWA	American Waterworks Association
AWS	American Welding Society
MISS	Manufacturers Standardization Society of the Valve and Fitting Industry
NBFU	National Board of Fire Underwriters
NEC	National Electrical Code
NEMA	National Electrical Manufacturers Association
NFPA	National Fire Protection Association
PCA	Portland Cement Association
UL	Underwriters Laboratory

UBC Uniform Building Code

C. CONTRACTOR'S BONDS

(1) Faithful Performance Bonds: As a part of the execution of this Contract, the Contractor shall furnish to the Owner bond payable to the City of Myrtle Beach in the form of Faithful Performance Bond set forth herein, secured by a surety company acceptable to the Owner, conditioned upon the faithful performance of all covenants and stipulations under this contract. Attorney in fact of Power of Attorney signature on bonds is permissible. The amount of the bonds shall be not less than one hundred percent (100%) of the total contract amount as set forth in the Agreement.

(2) Labor and Material Bonds: As a part of the execution of this Contract, the Contractor shall furnish to the Owner, a bond of surety company acceptable to the Owner in a sum of one hundred percent (100%) of the total contract amount, as set forth in the Agreement for the payment in full of all persons, companies or corporations who perform labor upon or furnish material to be used in the work under this Contract.

(3) Bid Bonds: 5% of total Contract.

(4) Notification of Surety Companies: The Contractor shall advise the surety companies and other signers of the bonds listed above to familiarize themselves with all of the conditions and provisions of this Contract, and they shall waive the right of special notification of any change or modification to this Contract or of extension of time, or of decreased or increased work, or of the cancellation of the Contract or of any other act or acts by the Owner or its authorized employees and agents, under the terms of this Contract and failure to so notify the aforesaid surety companies of changes shall in no way relieve the surety companies of their obligations under this Contract.

D. CONTRACTOR'S INSURANCE

(1) Public Liability and Property Damage.

The Contractor shall purchase and thereafter maintain for the term of this Agreement and any subsequent extensions hereto, public liability insurance to protect Contractor from claims for bodily injury and/or property damage which may result from Contractor's performance of this Agreement. The policy shall provide a combined single limit of liability of $1,000,000 per occurrence for bodily injury and property damage with an aggregate limit of not less than $1,000,000.

(2) Automobile Liability.

The Contractor shall purchase and thereafter maintain for the term of this Agreement and any subsequent extensions hereto, comprehensive automobile liability insurance to protect the Contractor from claims for bodily injury and property damage which may arise from Contractor's use of motor vehicles in the performance of this Agreement. The policy must provide coverage for "ANY AUTO (CODE 1)" and Contractual Liability (endorsement CA 0025). The policy shall provide for a combined single limit of $1,000,000 per occurrence for bodily injury and property damage.

(3) Workers' Compensation Insurance.

Prior to beginning the work, the Contractor shall take out full compensation insurance for all persons which may be employed directly or indirectly in the performance of this Agreement. The policy must provide Employers Liability coverage in the amount of $500,000 each accident; $500,000 bodily injury by disease each employee and $500,000 bodily injury by disease policy limit and shall be maintained in full force and effect during the term of this Agreement and any subsequent extensions hereto.

(4) Excess Liability Policy.

At the option of the Contractor, the limits of the primary general liability, automobile liability and employer's liability policies may be less than stipulated herein, with an excess policy providing the additional limits required. This form of coverage must be approved by the Owner and will only be acceptable when both the primary and excess policies include the coverages and endorsements required herein.

(5) Builders Risk Insurance.

If applicable, the Owner shall provide and maintain Builders Risk coverage in an amount equal to 100% of the Project's completed value. Coverage shall include but not be limited to, fire, lightning, windstorms, hail, smoke, explosion, riot, riot attending a strike, civil commotion, aircraft, vehicles, vandalism, malicious mischief, glass breakage, falling objects, water damage, collapse, flood and earthquake. The policy shall include coverage, but not be way of limitation, for all damage or loss to the work and to appurtenances, materials and equipment to be used on the Project while same are stored on the work site or approved storage area. Coverage does not extend to any tools, equipment or materials which are not intended to become part of the Project. All losses will be adjusted with and be made payable to the Owner. The Owner shall provide the Contractor with Certificates of Insurance reflecting the foregoing, and that coverage will remain in effect until the Project has been accepted by the Owner. The policy shall be endorsed with a "Waiver of Occupancy" to allow the Owner to use the property during the Project.

(6) Policy Endorsements.

The following clauses shall be endorsed to the policy(s) indicated below:

(a) General Liability and Automobile Liability

1. "It is understood and agreed that in consideration of the terms and conditions of this policy to which this endorsement is attached, the City of Myrtle Beach, their officials, agents and employees are recognized as additional named insureds under the policy and as such will be provided thirty (30) days written notice of non-renewal, exhaustion of aggregate limit, modifications of coverage or cancellation for any reasons and the company hereby agrees to provide such notice. Failure of the company to provide the required notice shall cause the coverage to continue in force for the benefit of the Owner, its officials, agents, and employees

until proper notification as required herein is provided, the provisions of the policy or any certificate of insurance to the contrary notwithstanding."

Contractor's insurance shall be primary to any insurance or self-insurance maintained by the Owner, its officials, agents or employees, which is considered excess and non-contributing for the purpose of this Agreement".

3. "The company shall not have recourse against the Owner for payment of any premiums, deductibles or for payment of any premiums, deductibles or for assessments under this policy."

4. "Failure of any named insured to comply with the reporting requirements of the policy shall not affect the coverage provided to the Owner as an additional insured."

5. If the Contractor, to meet the obligations of the Contract, obtains any endorsement to its General Liability Policy not specifically required by this Contract, the Contractor shall be required to have the Owner, as an additional insured, covered by the same endorsements or otherwise, including, but not limited to, completed operations coverage.

(b) Workers' Compensation

1. "Underwriters have no right of recovery of subrogation against the Owner for losses which result from work performed under this Agreement."

2. The cancellation provision is hereby amended to provide that the Owner will be provided thirty (30) days written notice in the event of coverage cancellation.

(7) Subcontractors.

Contractor shall not be required to name Subcontractors as additional insureds in any insurance policy required herein. Contractor will, however, secure certificates of insurance as evidence that each Subcontractor carries insurance to provide coverage under this Agreement in the same form as is required of the Contractor.

(8) Notifications of Insurance Companies.

It is the responsibility of the Contractor to notify all insurance companies to familiarize themselves with all terms and conditions of this Agreement. The insurance companies shall waive their right of notification by the Owner of any change or modification of this contract, or of decreased work or increased work, or of the cancellation of this Agreement or of any other acts by the Owner or their authorized employees or agents under the terms of this Agreement. The waiver by the insurance companies shall in no way relieve them of their obligations under this Agreement.

(9) Certificates of Insurance.

Contractor shall file with the Owner, certificates of insurance for approval by the Owner prior to the inception of any work. Renewal certificates shall be sent to the Owner 30 days prior to the expiration date of any policy required herein. The Owner reserves the right to require submission of certified copies of all insurance policies at its sole discretion. The Insurance Certificate shall be signed by the Insurance Agent.

(10) Coverage Cancellation or Unsatisfactory Coverage.

If at any time any of the foregoing policies shall be or become unsatisfactory to the Owner, as to form or coverage, or if a company issuing any such policy shall be or become unsatisfactory to the Owner, the Contractor shall, upon notice to that effect from the Owner, promptly obtain a new policy and submit the same for approval to the Owner. Upon failure of the Contractor to furnish, deliver and maintain the insurance coverages required herein, this Agreement, at the sole discretion of the Owner, may be forthwith declared suspended, discontinued or terminated. Failure of the Contractor to take out and/or maintain any required insurance shall not relieve the Contractor from any liability under this Agreement, nor shall the insurance requirements be construed to conflict with or otherwise limit the obligations of the Contractor concerning indemnification.

(11) Hold Harmless.

Contractor agrees to protect, defend, indemnify and hold the Owner, its officers, employees and agents free and harmless from and against any and all claims, losses, fines, penalties, damages, settlements, costs, changes, attorney's fees and costs, professional fees or other expenses and liabilities of every kind and character arising in whole or in part, out of or relating to any and all claims, liens, demands, obligations, actions, proceedings, or causes of action of every kind in connection with or arising out of this Agreement and/or the performance hereof, without regard to fault or negligence of the Contractor or the Owner, that arise in whole or in part from any claim or actual action(s) of, or failure(s) to act by the Contractor, its officers, employees, subcontractors or agents. Contractor further agrees to investigate, handle, respond to, provide to, provide defense for and defend the same, regardless of fault of the Contractor or Owner or whether claims made are directly attributable to actions or inactions of the Contractor, at its sole expense and agrees to bear all other cost and expenses related thereto. The contractor shall protect, indemnify, defend and hold the Owner harmless regardless of any claimed or actual, negligence, breach of warranty of any kind, including warranties related to plans and specifications, against or by the Owner, its officers, employees and agents, professionals or engineers. The Contractor also agrees to notify all insurers of claims made and demand defense of the Contractor and the Owner.

The Contractor also agrees to pay all attorney's fees, court fees, expert fees, and all other cost of litigation which are incurred by the Owner, which relate in whole or in part to any suit, arbitration, mediation, alternative dispute resolution, dispute, enforcement, default, declaratory judgment action, or other action in law or in equity, including appeals between Owner and Contractor, regardless of fault, which arise out or, in whole or in part, this agreement and or the performance hereof.

(12) Insurance Company Rating.

The Contractor's Insurance Company shall be rated by A. M. Best with a ranking of A- or better.

E. LOCATION OF EXISTING UTILITIES AND PIPING

The location of existing piping and underground utilities, as shown on the Drawings have been taken from existing record drawings, and information provided by other utilities. However, the Owner does not assume responsibility for the possibility that during construction utilities other than those shown may be different from the locations designated on the Drawings.

The Contractor shall proceed with caution in any excavation so that the exact location of underground utilities may be determined. Before excavation or boring is commenced, it shall be the duty of the Contractor to contact all utility companies to aid in locating their underground installations. The Contractor shall, at his own expense, furnish all labor and tools to verify and substantiate the indicated locations.

Any utility lines, services, poles or other structures which are damaged shall be repaired or replaced by the Contractor at his expense and the Contractor shall indemnify the Owner from any claims resulting from such damage.

Due to the nature of the work, adjustments may be required in new construction to meet existing conditions. Such adjustments shall be made by the Contractor without additional cost to the Owner unless the scope of such adjustment(s) is approved by the Owner in the form of a Change Order.

F. LABOR PROVISIONS

The Contractor shall employ only competent and skilled workers and forepersons in the conduct of the Project. The Owner shall have the authority to order the Contractor to remove from the Project any of Contractor's employees who refuse to obey instructions relating to the carrying out of the provisions and intent of the provisions of the Contract, or who are incompetent, unfaithful, abusive, threatening or disorderly in their conduct, and any such person shall not again be employed on the Project.

G. NOTICE OF STARTING WORK

The Contractor shall notify the Engineer and Owner in writing forty-eight (48) hours before starting work at the Project Site. In case of a temporary suspension of work, he shall give reasonable notice before resuming work.

H. EFFECT OF EXTENSION OF TIME

The granting of any extension of time on account of delays which in the judgment of the Owner are avoidable delays shall in no way operate as a waiver on the part of the Owner of its rights under this Contract.

I. EXTRA WORK

If extra work is assigned in accordance with the provisions of this contract, such work shall be considered a part hereof and subject to all its terms and requirements. Any such extra work shall be in the form of a Change Order to the Contract.

J. ASSIGNMENT OF CONTRACT

The Contract may not be assigned in whole or in part except upon the written consent of the Owner.

K. AMOUNT OF WORK PERFORMED BY PRIME CONTRACTOR

The prime Contractor shall perform, under his direct supervision and with individuals in his immediate employ, a minimum of 60% of the contracted work value, unless otherwise approved in writing by the Owner.

L. DISCREPANCIES

Anything called for by one of the Contract Documents and not called for by others shall be of like effect as if required or called for by all. Any discrepancies between any parts of the Contract Documents shall be called to the attention of the Engineer by the Contractor, in writing, for a decision before proceeding with the work affected thereby.

M. LIABILITY OF OWNER'S REPRESENTATIVES AND OFFICIALS

No official or employee of the Owner, nor the Engineer, nor any authorized assistant or agent of either, shall be responsible for construction means, methods, techniques, sequences or procedures, time of performance or for safety precautions and programs in connection with the work. The Engineer shall not be responsible for the failure of the Contractor to carry out the work in accordance with the Contract Documents. The Engineer shall not be responsible for acts or omissions of the Contractor, any Subcontractor(s), or any of their agents or employees, or any other persons performing the work.

N. EFFECT OF INSPECTION AND PAYMENT

Neither the inspection by the Engineer nor by any of his agents, nor by an inspector, nor any order, measurements, approved modification, certificate or payment of money, nor acceptance of any part or whole of work, nor any extension of time, nor any possession by the Owner or their agents, shall operate as a waiver of any provision of this Contract or of any power reserved therein to the Owner or any right to damages thereunder; nor shall the waiver of any breach of this Contract be held to be a waiver of any other or subsequent breach. All remedies shall be construed as cumulative.

II. LEGAL RELATIONS AND RESPONSIBILITY

A. LAWS TO BE OBSERVED

The Contractor shall keep himself fully informed of all applicable Federal, State, County, and

City laws, ordinances and regulations which in any manner affect those engaged or employed in the work or the materials used in the work or the conduct of the work or the rights, duties, powers, or obligations of the Owner or of the Contractor or which otherwise affect the Contract, and of all orders and decrees of bodies or tribunals having any jurisdiction or authority over the same. He shall at all times observe and comply with, and shall cause all his agents, subcontractors and employees to observe and comply with, all such laws, ordinances, regulations, orders and decrees; and shall protect and indemnify the Owner, the Engineer and all of their officers, agents and employees, against any claim, loss or liability arising or resulting from or based upon the violation of any such laws, ordinance, regulation, order or decree, whether by himself or by his agents, subcontractor or employees. If any discrepancy or inconsistency is discovered in the Contract Documents for the work in relation to such laws, ordinance, regulation, orders or decree, the Contractor shall forthwith report the same to the Engineer and the Owner.

B. PROVISIONS OF LAW

It is specifically provided that this Contract is subject to all applicable laws and that the rules of law shall prevail over any provision contained in any of the Contract Documents which may be in conflict thereto or inconsistent therewith.

III. RESPONSIBILITIES AND RIGHTS OF CONTRACTORS

A. ATTENTION TO WORK

The Contractor shall direct the work using his best skill and judgment and shall give his personal attention to and shall supervise the work to the end that it shall be performed faithfully, and when he is not personally present on the work, he shall at all times be represented by a competent superintendent or foreman who shall be present at the work and who shall receive and obey all instructions or orders given under this Contract, and who shall have full authority to execute the same, and to supply materials, tools and labor without delay and who shall be the legal representative of the Contractor. The Contractor shall be solely responsible for all construction means, methods, techniques, sequences and procedures, time of performance and for safety precautions and programs and for coordinating all portions of the construction. The Contractor shall be liable for the faithful observance of any instructions delivered to him or to his authorized representative.

B. ACCESS TO WORK

The Contractor shall at all times provide facilities for access and inspection of the work by representatives of the Owner and of such official governmental agencies having jurisdictional rights to inspect the work.

C. WORK SITE

(1) Use of Work Site. The Contractor shall confine his equipment, apparatus, the storage of materials, and operations of his workers to limits indicated by the law, ordinance, permit, Contract Documents or directions of the Owner.

The Contractors shall not load or permit any part of a structure to be loaded with weight that will endanger its safety. The Contractor shall observe and enforce the Owner's instructions regarding signs, advertisements, fires and smoke, unless such instructions are non-permissible in accordance within the jurisdiction of another authority.

(2) Use of Private Land. Except for where specifically noted in the Contract Documents, the Contractor shall not use any vacant lot or private land as a plant site, depository for materials, or as a spill site, or for any other purpose without the written authorization of the person(s) owning the property and the written approval of the Owner for the use of such property. A copy of the written Agreement between the property Owner and the Contractor shall be provided to the Owner.

D. SIGNS

The Contractor may place and maintain one sign board on the Project site. No other commercial or advertising signs will be allowed on the work site or on public property in the vicinity of the work. The location, layout and content of the sign shall be approved by the Owner.

E. LIABILITY OF CONTRACTOR

The Contractor shall do all of the work and furnish all labor, materials, tools and appliances, except as otherwise herein expressly stipulated, necessary or proper for performing and completing the work herein required in the manner and within the time specified in the Contract Documents. The mention of any duty or liability imposed upon the Contractor shall not be construed as a limitation or restriction or any general duty or other liability imposed upon the Contractor by this Contract, said reference to any specific duty or liability being made merely for the purpose of explanation. The Contractor shall provide all items, materials, articles, operations or methods listed, noted, mentioned or scheduled on the drawings or in any of the Contract Documents, including all labor, materials, plant, equipment, transportation and incidentals required and necessary for the completion of the work, and unless specifically shown otherwise herein, all plant, equipment and other works shall be completed in place and approved for operation. The Contractor shall be responsible to the Owner for the acts and omissions of all his employees, and all other persons performing any of the work under a contract with the Contractor.

F. ASSUMPTION OF RISKS

The Contractor shall rebuild, replace, repair, restore, and make good all injuries, damages, re-erection, and repairs occasioned or rendered necessary by causes of any nature whatsoever, to all or any portions of the work, except as otherwise stipulated, until completion and acceptance by the Owner.

G. RESPONSIBILITY FOR DAMAGE

The Contractor shall indemnify and save harmless the Owner, their officers, employees, and agents and the Engineer from any and all loss, liability or damage and from all suits, actions, damages, or claims, of every name and description arising from the acts and omission of the Contractor, its employees, agents, representatives, or subcontractors.

H. PROTECTION OF PERSONS AND PROPERTY

The Contractor will be solely and completely responsible for conditions of the work site, including safety of all persons and property during performance of the work. This requirement will apply continuously and not be limited to normal working hours.

The Contractor shall furnish such watchmen, guards, fences, warning signs, lights and walkways, and shall take all other precautions as shall be necessary to prevent damage to persons or property. All structures and improvements in the vicinity of the work shall be protected by the Contractor, and if such property is damaged, injured or destroyed by the Contractor, his employees, Subcontractors, or agents, it shall be restored to a condition as good as when he entered upon the work.

The safety provisions of applicable lays, including but not limited to building and construction codes, shall be observed. Machinery, equipment, and all hazards shall be eliminated or guarded in accordance with OSHA standards.

Any construction inspection conducted by the Owner and/or Engineer of the contractor's performance is not intended to include review of the adequacy of the Contractor's safety measures.

I. PROTECTION OF CONTRACTOR'S WORK AND PROPERTY

The Contractor shall protect his work, supplies, and materials from damage due to the nature of the work, the action of the elements, trespassers or any cause whatsoever, until the completion and acceptance of the work.

Neither the Owner nor any of their officers, employees or agents nor the Engineer assumes any responsibility for collecting indemnity from any person or persons causing damage to the work of the Contractor.

J. PROTECTION OF EXISTING STRUCTURES

Unless otherwise indicated in the Contract Documents or unless otherwise taken care of by the owners thereof, all utilities and all structures of any nature, whether below or above ground, that may be affected by the work shall be protected and maintained by the Contractor and shall not be disturbed or damaged by him during the progress of the work; provided that should the Contractor disturb, disconnect, or damage any utility or any structure, all expenses of whatever nature arising from such disturbance or the replacement or repair thereof shall be borne by the Contractor.

K. MAINTENANCE OF TRAFFIC

Throughout the performance of the work or in connection with this Contract, the Contractor shall construct and adequately maintain suitable and safe crossing over the trenches and such detours as are necessary to care for public and private traffic. The material excavated from trenches shall be compactly deposited along the side of the trench or elsewhere in such manner as shall give as little inconvenience as possible to the traveling public, to adjoining property owners, to other contractors or to the Owner. Where necessary or required, road detours must be approved by the

Owner or other appropriate authorities at least 24 hours in advance of the proposed rerouting. MUTCD standards must be adhered to at all times.

L. PRESERVATION OF STAKES AND MARKS

The Contractor shall carefully preserve all bench marks, reference points, stakes, property pins, survey monuments and like items. In case he causes damage or disturbance, he will be charged with the resulting expense of replacement and shall be responsible for any mistakes that may be caused by their loss or disturbance.

M. APPROVAL OF CONTRACTOR'S PLAN

The approval by the Engineer or the Owner of any drawing or any method of work proposed by the Contractor shall not relieve the Contractor of any of his responsibility for any errors therein and shall not be regarded as any assumption of risk of liability by the Owner or any officer or employee thereof, and the Contractor shall have no claim under the Contract due to the failure or inefficiency of any plan or method approved. Such approval shall be considered to mean merely that the Engineer or Owner have no objection to the Contractor's using, upon his own full responsibility, the plans or methods proposed.

N. SUGGESTIONS TO CONTRACTOR

Any plan or method of work suggested by the Engineer or Owner to the Contractor, but not specified or required, if adopted or followed by the Contractor in whole or in part, shall be used at the risk and responsibility of the Contractor. The Engineer and the Owner shall assume no responsibility therefore.

O. LICENSES, PERMITS AND REGULATIONS

The Contractor shall secure all Federal, State, County and City licenses required by law. He shall obtain and pay for all necessary permits. He shall give all notices and comply with all laws, ordinances and regulations bearing on the conduct of the work as drawn and specified. No Building Permit fee will be assessed by the City of Myrtle Beach.

P. TAXES

Contractor shall, without additional expenses to the Owner, pay all applicable Federal, State and Local sales and other taxes, except taxes and assessments on the real property comprising the site of the Project.

Q. CONSTRUCTION UTILITIES

The Contractor shall provide and maintain all necessary utilities, including but not limited to water, electricity, telephones, roads, fences, sanitary facilities, suitable storage places, except as may be otherwise specifically stipulated in the Contract Documents. Sanitary facilities shall be suitable for those employed on this Contract and of a type that will not create a public nuisance. He shall provide and maintain an adequate potable water supply for use of employees at the site of the work. Sanitary facilities and potable water supply shall be subject to approval of Local and State regulatory agencies.

R. COORDINATION

The Contractor shall coordinate his schedule with all other contractors or employees of the Owner who may be working in the vicinity of the work site. He shall conduct his operation as to interfere to the least possible extent with the work of such contractors or employees.

S. SUBCONTRACTORS

The Contractor shall notify the Owner in writing of the names of all Subcontractors he proposed to employ on the Contract and shall not employ any Subcontractors until the Owner's approval in writing covering such Subcontractors has been obtained. Such approval shall not be unreasonably withheld.

The Contractor agrees to be fully and directly responsible to the Owner for all acts and omissions of his Subcontractors and of any other person employed directly or indirectly by the Contractor or Subcontractors, and this Contract obligation shall be in addition to the liability imposed by law upon the Contractor.

Nothing contained in the Contract Documents shall create any contractual relationship between Subcontractor and the Owner. It shall be further understood that the Owner will have no direct relations with any Subcontractor. Any such necessary relations between the Owner and the Subcontractor shall be handled through the Contractor.

The Contractor agrees to bind every Subcontractor by all terms of the Contract Documents as far as applicable to the Subcontractor's work.

T. UNSATISFACTORY SUBCONTRACTORS

Should any Subcontractor fail to perform in accordance with the provisions of this Contract, the Contractor shall be notified in writing to take proper corrective action, or the Owner may require that the Contractor terminate the Subcontractor.

U. REMOVAL OF CONDEMNED MATERIALS AND STRUCTURES

The Contractor shall remove from the work site all rejected or condemned materials or structures of any kind brought to the work site or incorporated in the work. Upon his failure to do so, or to make satisfactory progress in so doing within forty-eight (48) hours after the service of a written notice from the Engineer or Owner, the rejected or condemned material or work may be removed by the Owner and the cost of such removal shall be subtracted from monies that may be due or may become due to the Contractor on account of or by virtue of this Contract. No such rejected or condemned material shall again be offered for use by the Contractor under this Contract.

V. ERRORS AND OMISSIONS

If the Contractor, in the course of the work, finds any errors or omissions in the Contract Documents or in the layout as given by survey points and instructions, or if he finds any discrepancy between the Contract Documents and physical conditions of the work site he shall immediately notify the Engineer, in writing for correction. Any work done after such discovery,

until authorized, will be done at the Contractor's risk.

W. PROOF OF COMPLIANCE WITH CONTRACT

In order that the Engineer and the Owner may determine whether the Contractor has complied with the requirements of the Contract Documents, compliance with which is not readily ascertainable through inspection and tests of the work and materials, the Contractor shall, at any time requested, submit to the Engineer and the Owner, properly authenticated documents or other satisfactory proof as to his compliance with such requirements.

X. CLEANING UP

The Contractor shall not allow the work site to become littered with trash and waste materials, but shall maintain the same in a neat and orderly condition throughout the term of the Contract. The Contractor shall dispose of any such materials in accordance with all applicable laws. On or before completion of the work, the Contractor shall thoroughly clean all pits, pipes, chambers, or conduits which are a part of the work or premises which he has entered upon, shall bear down and remove all temporary structures built by him and shall remove rubbish of all kinds from any of the grounds he has occupied and leave them in a neat and clean condition.

Y. FINAL GUARANTY

All workmanship and materials shall be guaranteed by the Contractor for a period of one year from the date of final acceptance by the Owner, unless otherwise stipulated in the Contract Documents.

If, within said guaranty period, repair or changes are required in connection with the work, which, in the opinion of the Owner, is rendered necessary as the result of use of materials, equipment or workmanship which are inferior, defective or not in accordance with the terms of the Contract, the Contractor shall promptly upon receipt of written notice from the Owner, and without expense to the Owner: (a) place in satisfactory condition all of such work, correct all defects therein; and (b) make good all damage to the building, site, equipment or contents thereof, which in the opinion of the Owner, is the result of the use of materials, equipment or workmanship which are inferior, defective, or not in accordance with the terms of the Contract; and (c) make good any work or material, or the equipment and contents of building structure or site disturbed in fulfilling any such guarantee.

If the Contractor fails to comply within ten (10) days after receipt of written notice with the terms of this guaranty, the Owner may have the defects corrected, and the Contractor shall be liable for all expenses incurred; provided, however, that in case of an emergency where in the opinion of the Owner, delay would cause serious loss or damage, repairs may be made without notice being given to the Contractor and the Contractor shall pay the cost thereof.

Z. PATENTS

1. Except as otherwise provided in these Contract Documents, Contractor shall assume all costs arising from the use of patented materials, equipment, devices, or processes used on or incorporated in the work, and agrees to indemnify and save harmless Owner, Engineer, and their duly authorized representatives or employees, from all suits at law, or actions of

every nature for, or on account of the use of, any patented materials, equipment, devises, or processes.

2. Should Contractor, his agents, servants, or employees, be enjoined from furnishing or using any invention, article, material, or appliance supplied or required to be supplied or used under this Contract, Contractor shall promptly offer other articles, materials, or appliances in lieu thereof, of equal efficiency, quality, finish, suitability, and market value, for review by Engineer. If Engineer should disapprove the offered substitutes and should elect, in lieu of a substitution, to have supplied, and to retain and use, any such invention, article, material, or appliance as may by this Contract be required to be supplied, Contractor shall pay such royalties and secure such valid licenses as may be requisite and necessary for Owner and officers, agents, and employees, or any of them, to use such invention, article, material, or appliance without being disturbed or in any way interfered with by any proceeding in law or equity on account thereof. Should Contractor neglect or refuse to make any approved substitution promptly, or to pay such royalties and secure such licenses as may be necessary, then in that event Engineer shall have the right to make such substitution, or Owner may pay such royalties and secure such licenses and charge the cost thereof against any money due Contractor from Owner, or recover the amount thereof from him and his sureties notwithstanding that final payment under this Contract may have been made.

AA. LEGAL RESPONSIBILITY OF CONTRACTOR IN PERFORMING WORK

The Contractor shall be required to comply with all Local, State, and Federal laws or regulatory requirements applicable to the performance of this Contract, to include any laws promulgated or enacted during the Contract Time. Lack of knowledge of such laws or regulations shall not relieve the Contractor of this duty. Any losses resulting to the Owner because of the failure of the Contractor to comply with this duty shall be borne by the Contractor.

BB. WARRANTY OF TITLE

No material, supplies, or equipment to be installed or furnished under this Contract shall be purchased subject to any chattel mortgage or under a conditional sale, lease-purchase or other agreement by which an interest therein or in any part thereof is retained by the seller or supplier. The Contractor shall warrant good title to all materials supplied and equipment installed or incorporated in the work and upon completion of all work, shall deliver the same together with all improvements and appurtenances constructed or placed thereon by him to the Owner free from any claims, liens or charges. Neither the Contractor nor any person, firm or corporation furnishing any material or labor for any work covered by this Contract shall have any right to a lien upon any improvement or appurtenance thereon. Nothing contained in this paragraph, however, shall defeat or impair the right of persons furnishing materials or labor to recover under any bond given by the Contractor for their protection or any rights under any law permitting such persons to look to funds due the Contractor in the hands of the Owner. The provisions of this paragraph shall be inserted in all subcontracts and material contracts and notice of its provisions shall be given to all persons furnishing materials for the work when no formal contract is entered into for such materials.

IV. RESPONSIBILITIES AND RIGHTS OF OWNER

A. SURVEYS AND STAKING

The Owner, through the Engineer, will survey and place control stakes for general layout and control grades for the construction work. The protection and care of such stakes shall thereafter be the responsibility of the Contractor, and any stakes lost or destroyed will be replaced at the Contractor's expense.

B. RIGHTS-OF-WAY

The Owner will provide all necessary rights-of-way and easements.

C. AUTHORITY OF THE ENGINEER

All work performed under this Contract shall be in accordance with the Contract Documents and in a good workmanlike manner. To prevent disputes and determine acceptability and fitness of the several kinds of work and materials which are to be paid for under this Contract the Engineer shall: (a) decide all questions relative to the true construction meaning, and intent of the Contract Documents; (b) decide all questions which may arise relative to the classifications and measurements of quantities and materials and the fulfillment of this Contract; (c) and have the authority to reject or condemn all work or material which does not conform to the terms of this Contract. The Engineer's estimate and decision in all matters shall be a condition precedent to an appeal to the Owner for other compensation under this Contract, and a condition precedent to any liability on the part of the Owner to the Contractor on account of this Contract.

D. INSPECTION

The Engineer, Owner, and their representatives shall at all times have access to the work whenever it is in preparation or progress, and the Contractor shall provide proper facilities for such access and for inspection.

If the Contract Documents, the Engineer's instructions, laws, or ordinances require any work to be specifically tested or approved, the Contractor shall give the Engineer and the Owner timely notice of the date and time fixed for the inspection or test.

If any work for which inspection is required in accordance with the Contract is covered without the approval and consent of the Engineer, the work shall be uncovered for inspection and restored at the Contractor's expense. Any work for which inspection is not specifically required by the Contract may be uncovered for inspection by the Engineer. If such work is found to be in accordance with the Contract Documents, the Owner will pay the cost of re-examination and replacement. If such work is not in accordance with the Contract Documents, the Contractor shall pay such cost.

Properly authorized inspectors shall be considered to be the representatives of the Owner, limited to the duties and power entrusted to them. Inspectors shall be authorized to inspect materials and workmanship of those portions of the work to which they are assigned, either individually or collectively, and under instructions of the Engineer and Owner are to report any and all deviations from the Contract Documents which may come to their notice. Any inspector shall have the right to order the work stopped if, in his judgment, such action is necessary to (a) allow proper inspection, (b) avoid irreparable damage to the work, or (c) avoid subsequent condemnation of work which could not be readily replaced or restored to an acceptable condition. Such stoppage

shall be for a period reasonably necessary for a determination by the Engineer that the work will in fact proceed in due fulfillment of all Contract requirements.

E. RETENTION OF DEFECTIVE WORK

If any portion of the work performed or material furnished under this Contract shall prove defective, and if the imperfection in the same shall not be of sufficient magnitude or importance to make the work dangerous or wholly undesirable, or if the removal of such work is impracticable or will create conditions which are dangerous or undesirable, the Engineer, with the approval of the Owner, shall have the right and authority to retain such work instead of requiring the defective work to be removed and reconstructed. The Engineer shall recommend to the Owner such deductions therefore in the payments due or to become due the Contractor as may be just and reasonable, and the Owner may make such deductions as are reasonable.

F. CHANGES IN WORK

The Owner shall have the right to order additions to, omissions from, or corrections, alterations and modifications in the line, grade, form dimensions, plan or kind or amount of work or materials herein contemplated, or any part thereof, either before or after the beginning of construction. Changes involving an increase or decrease in the cost of the work, the time permitted for the work, or inconsistencies within the Contract Documents, shall be approved in accordance with terms set forth in "Alterations, Omissions and Extra Work" of these General Provisions, and such order will be binding upon the Contractor. Such alterations shall in no way affect, vitiate, or make void this Contract or any part thereof, except that which is necessarily affected by such alterations.

In any case of neglect or refusal by the Contractor to perform any extra work which may be authorized by the Owner or to make satisfactory progress in the execution of the same, the Owner may employ any person or persons to perform such work and the Contractor shall not in any way interfere with the person or persons so employed.

G. ADDITIONAL DRAWINGS

The Owner may furnish, through the Engineer, additional drawings during the progress of the work as are necessary to make clear or to define in greater detail the intent of the Contract Documents. The Contractor shall make his work conform to all such drawings.

H. EMERGENCY PROTECTION

In the event of any emergency which threatens loss, damage or injury to persons or property, and which requires immediate action to remedy, the Owner, with or without notice to the Contractor, may provide suitable protection to the said property and persons by causing such work to be performed and such material to be furnished as shall provide such protection as the Owner may consider necessary and adequate. The cost and expense of such work and material so furnished shall be borne by the Contractor, and if the same shall not be paid on presentation of the bills therefore, such costs shall be deducted from any amounts due or to become due the Contractor.

The performance of such emergency work under the direction of the Owner shall in no way relieve the Contractor from any damages or liability which may arise during or after such

precautions have been taken by the Owner.

I. SUSPENSION OF WORK

The Owner may at any time suspend the work, or any part thereof by giving written notice to the Contractor. The work shall resume by the Contractor on a date fixed in a written notice from the Owner to the Contractor. If such stoppage is due to no fault of the Contractor, and not otherwise authorized by other provisions of the Contract Documents, the Owner shall reimburse the Contractor for reasonable expenses and adjust the time allowed for Contract completion; provided that there shall be no reimbursement if the period of suspension occurs after expiration of the time allowed for completion of the work, exclusive of any extension of time.

J. RIGHT OF OWNER TO TERMINATE CONTRACT

In the event that any of the provisions of the Contract Documents are violated by the Contractor or by any of his Subcontractors, the Owner may serve written notice upon the Contractor and the Surety of its intention to terminate this Contract. Such notice shall contain the reasons for intention to terminate this Contract. Unless within ten (10) days after the serving of such notice upon the Contractor, such violation shall cease or satisfactory arrangements for correction be made in writing, the Contract shall cease and terminate. In event of such termination, the Owner shall immediately serve notice thereof upon the Surety and the Contractor, and the Surety shall have the right to perform the Contract. If the Surety does not commence performance thereof within thirty (30) days from the date of the mailing to such Surety of said notice of termination, the Owner may take over the work and prosecute the same to completion by contract or force account at the expense of the Contractor, and his Surety shall be liable to the Owner for any excess cost to the Owner.

Where the Contractor has failed to complete minor items of work within the time set for completion of the Contract, but limited to cases where the value of such minor work does not exceed five percent (5%) of the total construction cost of the work, the Owner shall have the right, without terminating this Contract, of completing said items of work and then deducting from the sums due the Contractor under this Contract, the total cost incurred in completing such minor items of work. In such cases, the Owner may complete such minor items of work by force account or by employing some other Contractor. If the Owner adopts this procedure, it shall deliver to the Contractor a written statement, describing the items not completed, or imperfectly completed, and shall in such statement, demand that the Contractor complete the work in conformity with the Contract and within a time to be fixed by the Owner. If the Contractor neglects to comply within the time stated, the Owner may proceed, as herein above set forth. The time within which the Contractor shall be required to complete the items set forth in such statement will depend on the amount of time required for the performance of said work, but shall not in any event be less than ten (10) days, nor more than thirty (30) days.

K. PLACING PORTIONS OF WORK IN SERVICE

If desired by the Owner, portions of the work may be placed in service as completed, and the Contractor shall give proper access to the work for this purpose. Use and operation shall not constitute an acceptance of the total Project.

V. WORKMANSHIP, MATERIALS AND EQUIPMENT

A. WORKMANSHIP

All workmanship shall be of the highest quality, performed by persons skilled in the applicable trades, and shall be subject to the inspection, approval, or rejection by the Owner in accordance with the requirements and intent of the Contract Documents. The Owner or Engineer shall have the right to order the Contractor to correct or replace unacceptable workmanship. Any other portions of the work disturbed or damaged by such correction or replacement shall be made good at the Contractor's expense.

B. INTERPRETATION OF SPECIFICATIONS AND DRAWINGS

The Technical Specifications and the Drawings are intended to be explanatory of each other. Any work indicated on the Drawings and not in the Technical Specifications, or vice versa, shall be brought to the attention of the Engineer for verification of the actual intent. Contradictions of this nature not brought to the attention of the Engineer for correction or verification, and acted upon by the Contractor shall be considered "At the Contractor's Risk", and if necessary, corrected by the Contractor at his expense. All work shown on the Drawings, the dimensions of which are not labeled, shall be determined by the Engineer. Should it appear that the work to be done, or any of the matters relative thereto, is not sufficiently detailed or explained in these Contract Documents, including the Drawings, the Contractor shall apply to the Engineer for such further explanations as may be necessary and shall conform thereto as part of this Contract. In the event of any doubt or question arising respecting the true meaning of the Contract Documents, reference shall be made to the Owner and the decisions thereon shall be final.

C. GENERAL QUALITY OF MATERIALS

Materials and equipment shall be new and of a quality equal to that specified or approved. Whenever under this Contract it is provided that the Contractor shall furnish materials or manufactured articles, or shall do work for which no detailed specifications are set forth, the materials or manufactured articles shall be approved by the Owner upon recommendation of the Engineer. In general, the work performed shall be in full conformity and harmony with the intent to secure the best standard of construction and equipment of the work as a whole or in part.

D. MATERIALS AND EQUIPMENT SPECIFIED BY NAME

Except as hereinafter otherwise provided, whenever any material or equipment is indicated or specified by patent or proprietary name, or by the name of the manufacturer, such specification shall be considered as used for the purpose of describing the material or equipment desired and shall be considered as followed by the words, "or approved equal", and the Contractor may offer any material or equipment which shall be approved by the Owner and Engineer and be equal in every respect to that specified; provided, that written approval is obtained from the Owner prior to incorporation into the work. See Section 01631 – Substitutions, for additional conditions and requirements.

E. APPROVAL OF MATERIALS AND EQUIPMENT

All materials and equipment offered to be furnished for the work are subject to inspection and

approval or rejection by the Engineer or Owner. Approval shall be obtained prior to purchase and delivery of materials and equipment to the work site.

F. DRAWINGS OF EQUIPMENT AND FABRICATED MATERIALS

As soon as possible after execution of the Contract, the Contractor shall submit to the Engineer a complete listing of the manufacturers of each item of equipment or assembly fabricated off the site which he proposes to furnish on the Project, together with sufficient information, including shop assembly and detail drawings, manufacturers' specifications and performance data to demonstrate clearly that the materials and equipment to be furnished comply with the provisions and intent of the Contract Documents. If the information shows any deviation from the Contract Documents, the Contractor shall, by a statement in writing accompanying the submittal, advise the Engineer of the deviation and reason. The Contractor shall also submit to the Engineer shop drawings showing details of structural steel and concrete reinforcing steel, banding details, piping details, and of other items necessary for the proper installation of material into the completed work.

All drawings and details described herein, when submitted, shall bear the stamp of the Contractor and initials of his authorized representative indicating that the Contractor has reviewed and approved such drawings as meeting his interpretation of the requirements of the Contract.

The Submittal shall be made in triplicate plus the number of copies that the Contractor desires to be returned to him. Upon review, the Engineer will return all but three copies, which will be stamped or marked either approved, approved subject to minor designated changes, or disapproved. In the latter case an explanation will be given as to why the material or equipment is unsatisfactory.

The Contractor shall make any indicated corrections on the drawings returned and shall resubmit corrected drawings until final approval. Approval by the Engineer of Shop Drawings and other data submitted by the Contractor shall not relieve the Contractor from responsibility for errors or omissions therein, or for furnishing the materials and equipment of proper dimension, size, quantity, quality, and all performance characteristics to meet the requirements and intent of the Contract Documents.

The Contractor shall have no claim for damages or extension of time on account of any delay in the work resulting from the reasonable and timely rejection of material, revision and resubmittal of drawings and other data for approval.

G. SUBSTITUTIONS

If the Contractor proposes to substitute any equipment, facilities or processes in place of those specified in the Contract Documents, the Contractor shall prepare and submit to the Engineer detailed drawings showing any modifications, including, but not limited to structures, reinforcing steel, piping, electrical and mechanical work, to adapt the Drawings to the alternate equipment or facilities. The Engineer, with the Owner, will review such Drawings and may approve, reject, or indicate thereon changes necessary to comply with the project requirements. See Section 01631 – Substitutions, for additional conditions and requirements.

H. SAMPLES

Whenever requested by the Engineer or Owner, or when called for by the Contract Documents, sample or test specimens of the materials to be used or offered for use in the work shall be obtained or prepared by and at the expense of the Contractor. The samples shall be representative in all respects of the material offered or intended to be used, shall be supplied in such quantities and sizes as may be required for proper examination and tests, and shall be delivered to the Engineer freight prepaid along with identification as to their sources and types or grades. All samples shall be submitted and approved before shipment of the material to the work site.

No materials or equipment of which samples are required to be submitted for approval shall be incorporated into the work until such approval has been given by the Engineer.

I. TESTS

Unless otherwise stipulated in the Contract Documents, all testing required shall be provided by and at the sole expense of the Contractor. All laboratory tests required shall be made by a testing laboratory approved by the Owner.

All tests shall be performed in accordance with specific procedures identified in the Contract Documents, or if not therein specified, they shall be performed in accordance with applicable recognized standard practice. Reports of tests provided by the Contractor shall be promptly submitted to the Engineer and the Owner, or if provided by the Engineer, copies shall be promptly submitted to the Contractor.
The Contractor shall give the Engineer and the Owner sufficient notice of the time and place of any test to be made at the point of manufacture, assembly, or fabrication in order that the Engineer or the Owner may witness the test.

J. MATERIAL TESTS

All materials incorporated in the work shall be subject to inspection and test as follows: All tests, except as noted, shall be made by a laboratory, employed and paid for by the Contractor. The laboratory shall be approved by the Owner prior to being retained by the Contractor. Samples at the place of manufacture shall be taken by a representative of the laboratory. Samples of construction materials from the site of the work, such as sand, gravel, concrete cylinders, and pipes for which laboratory tests are required, shall be taken, assembled or prepared on the site of the work by representatives of the laboratory or Owner. Signed copies of test reports on laboratory forms or letterheads shall be delivered to the Engineer as soon as available.

K. STORAGE OF MATERIALS & EQUIPMENT

Materials shall be stored so as to ensure the preservation of their quality and fitness for the work and to allow access for proper inspection. Store materials so as to protect materials from damage from the general public, and so as to protect the general public from injury.

L. OPERATING AND MAINTENANCE DOCUMENTATION

Before final acceptance of the work, the Contractor shall deliver to the Engineer a complete set of suitable operating and maintenance instructions and parts list documentation for each piece of

equipment or equipment assembly. These instructions and lists shall be assembled in an orderly arrangement and shall be accompanied by a tabulation of the information provided for each item of equipment.

M. COMPLIANCE WITH STATE SAFETY CODE

All necessary machinery guards, railings, and other protective devices and equipment shall be provided as specified by the OSHA, or other regulatory agencies or departments.

VI. PROSECUTION OF WORK

A. EQUIPMENT AND METHODS

The work under the Contract shall be prosecuted with all materials, tools, machinery, apparatus and labor, and by such methods as are necessary to complete the work. If at any time, any part of the Contractor's plant or equipment or any of his methods of execution of the work appear to the Owner or the Engineer to be unsafe, inefficient or inadequate to insure the required quality or rate of progress of the work, he may order the Contractor to increase or improve his facilities or methods and the Contractor shall comply promptly with such orders; but neither compliance with such orders nor failure of the Engineer or Owner to issue such orders shall relieve the Contractor from his obligation to secure the degree of safety, the quality of the work and the rate of progress required. The Contractor alone shall be responsible for the safety, adequacy and efficiency of his plant, equipment and methods.

If the Contractor fails to promptly comply with the order of the Owner or Engineer issued in accordance with this Paragraph, the Owner shall have the right to terminate the Contract.

B. TIME OF COMPLETION

The Contractor shall promptly begin the work under the Contract, and all portions of the project made the subject of this Contract shall begin and be so prosecuted that they shall be completed and ready for full use within the time specified elsewhere in the Contract Documents.

C. AVOIDABLE DELAYS

Avoidable delays in the prosecution or completion of the work shall include all delays which might have been avoided by the exercise of care, prudence, foresight or diligence on the part of the Contractor.

Delays in the prosecution of parts of the work, which may in themselves be unavoidable but do not necessarily prevent or delay the prosecution of other parts of the work nor the whole work within the time herein specified, will be deemed avoidable delays within the meaning of this Contract.

D. UNAVOIDABLE DELAYS

Unavoidable delays in the prosecution or completion of the work under this Contract shall include all delays which may result through causes beyond the control of the Contractor and which he could not have prevented by the exercise of care, prudence, foresight or diligence. Orders issued

by the Owner changing the amount of work to be done, the quantity of materials to be furnished, or the manner in which the work is to be prosecuted, failure of the Owner to provide rights-of-way and unforeseen delays in the completion of other contractors under contract with the Owner will be considered unavoidable delays, so far as they necessarily interfere with the Contractor's completion of the whole of the work. Delays due to adverse weather conditions, unless of an extreme nature such as hurricanes, floods, or tornados will not be regarded as unavoidable delays as the Contractor should understand that such conditions are to be expected and plan his work accordingly.

E. NOTICE OF DELAYS

Whenever the Contractor anticipates or experiences any delay in the prosecution of the work he shall immediately notify the Owner and Engineer, in writing, of such delay and its cause in order that the Owner may take immediate steps to prevent, if possible, the occurrence or continuance of the delay, or, if this cannot be done, may determine whether the delay is to be considered avoidable or unavoidable, how long it continues, and to what extent the prosecution and completion of the work is to be delayed thereby.

After the completion of any part or the whole of the work, the Owner, in approving the amount due the Contractor, will assume that any and all delays which have occurred in its prosecution and completion have been avoidable delays, except such delays as shall have been called to the attention of the Owner at the time of their occurrence and later found by the Owner to have been unavoidable. The Contractor will make no claims that any delay not called to the attention of the Owner at the time of its occurrence has been an unavoidable delay.

F. EXTENSION OF TIME

(1) UNAVOIDABLE DELAYS: For delays which are unavoidable, as determined by the Owner, the Contractor will be allowed, upon Contractor application, an extension of time beyond the time specified for completion elsewhere in the Contract Documents, proportionate to the length of such unavoidable delay. No liquidation damages or engineering and inspection costs as are charged in the case of extensions of time for avoidable delays, will be assessed for unavoidable delays.

(2) AVOIDABLE DELAYS: If the work called for under this Contract is not finished and completed in all parts and in accordance with all requirements, within the time specified for completion in the Contract Documents (including extensions of time granted because of unavoidable delay), or if at any time it shall appear to the Owner that the Contractor will be unable to finish and complete the work, the Owner may grant the Contractor such extensions of time as the Owner deems in its best interest.

If such extension of time for Avoidable Delay is not granted, the provisions of the Contract Document, at the discretion of Owner, may be followed. However, at the option of the Owner and where the delay may be of such a duration not to inflict serious injury to the operations of the Owner in regard to the project, the Owner may assess liquidated damages for each calendar day delay exceeding the contract completion date. The sum of liquidated damages on a per day basis will be stipulated in the Contract Documents.

G. UNFAVORABLE WEATHER AND OTHER CONDITIONS

During unfavorable weather and other unfavorable conditions, the Contractor shall pursue only such portions of the work as shall not be damaged thereby. No portions of the work whose satisfactory quality or efficiency will be affected by an unfavorable condition shall be constructed while these conditions exist unless by special means or precautions approved by the Owner and Engineer.

VII. PAYMENTS AND CONTRACT COMPLETION

A. PROGRESS ESTIMATES AND PAYMENTS

Immediately upon execution and delivery of the Contract and before the first partial payment is made, the Contractor shall deliver to the Owner an estimated construction progress schedule in form satisfactory to the Owner, showing the proposed dates of commencement and completion of each of the various subdivisions of work required under the Contract Documents and the anticipated amount of each monthly payment that will become due the Contractor in accordance with the progress schedule.

No payments under the Contract will be made except upon the presentation by the Contractor of a Periodical Estimate for Payment approved by the Engineer. Payment forms, supplied by the Owner, shall show that the work covered by the payments has been completed and the payments therefore are due in accordance with the Contract. Such payment forms shall be submitted to the Engineer, by the Contractor, by the 25th day of a calendar month to permit review. Upon presentation of certified copies of purchase bills and freight bills, the Owner will include in such monthly estimate, payments for materials that will eventually be incorporated in the work, providing that such material is suitably stored on the work site or other Owner approved site, at the time of submission of the estimate. Such materials, when so paid for by the Owner, will become the property of the Owner and, in case of default on the part of the Contractor, the Owner may use or cause to be used by others these materials in construction of the work. However, the Contractor shall be responsible for safeguarding such materials against loss or damage of any nature whatsoever, and in case of any loss or damage, the Contractor shall replace such lost or damaged materials at no cost to the Owner.

Except as otherwise provided, the first estimate shall be of the value of the work performed and materials delivered and suitably and safely stored at the work site or other Owner approved site. Every subsequent estimate, except the final estimate, shall be for the value of the work performed and materials delivered and suitably stored since the preceding estimate was made; and provided, also, that materials delivered for the Project for which payment is included in the estimate, shall not be removed from the work site or approved storage site without the written consent of the Owner.

The estimates shall be signed by the Engineer and approved by the Owner, and after such approval, the Owner, subject to the foregoing provisions, will pay or cause to be paid to the Contractor, in the manner provided by law, an amount equal to ninety percent (90%) of the estimated value of the work performed, and an amount equal to ninety percent (90%) of the value of the materials furnished, delivered, unused and suitably and safely stored as provided above.

B. ALTERATIONS, OMISSIONS AND EXTRA WORK

The Owner reserves the right to increase or decrease by 15% the quantity of any item or portion of the work, or to omit portions of the work as may be deemed necessary or advisable by the Owner and, also, to make such alterations or deviations, additions to, or omissions as may be deemed necessary during the progress of the work. Upon written order of the Owner, the Contractor shall proceed with the work as increased, decreased or altered.

The Engineer is authorized to order, on behalf of the Owner, minor changes in the work which do not involve extra cost or an extension of time to the Contract and which does not change the character of the work. The Engineer is not authorized to order any other changes, alterations, omissions, additions, or extra work unless the same is approved by a written Change Order properly authorized in writing by the Owner. No claim of Contractor for extra compensation because of any change, alteration, omission, addition or extra work shall be paid or be payable unless a written order to the same change is signed by the Owner.

All adjustments, if any, in the Contract Price to be paid to Contractor because of any such change, alteration, deletion, addition, or extra work shall be made only to the extent and in the manner provided in the Contract Documents. Such alteration shall in no way affect, vitiate, or make void this Contract or any part thereof, except that such is necessarily affected by such alterations and is clearly the evident intention of the parties to this Contract. Any such work performed by the Contractor prior to execution of the Change Order by the Owner shall be at the risk of the Contractor. In case of neglect or refusal by the Contractor to perform any extra work which may be authorized by the Owner, the Owner may employ any person or persons to perform such work and the Contractor shall not in any way interfere with the person or persons so employed.

When any changes decrease the amount of work to be done, such changes shall not constitute a basis or reason for any claim by Contractor for extra compensation or damages on account of any anticipated profits which he thereby loses on the omitted work, and Contractor shall not be entitled to any compensation or damages therefore.

C. OWNER'S RIGHT TO WITHHOLD CERTAIN AMOUNTS

The Owner may withhold from payments to the Contractor, in addition to the retained percentage, such an amount or amounts as may be necessary to cover:

(1) Payments that may be earned or due for just claims for labor or materials furnished in and about the work.

(2) Defective work not remedied.

(3) Failure of the Contractor to make proper payments to a subcontractor.

(4) Reasonable doubt that this Contract can be completed for the balance then unpaid.

(5) Damage to another Contractor, where there is evidence thereof.

(6) The Contractor's failure to resolve bodily injury or property damage claims of any person or entity.

The Owner will have the right to act as agent for the Contractor in disbursing such funds as have been withheld, pursuant to this Paragraph, to the party or parties who are entitled to payment there from. The Owner shall render to the Contractor a proper accounting of all such funds disbursed in behalf of the Contractor.

The Owner also reserves the right to refuse payment of the final estimate due to the Contractor until it is satisfied that all subcontractors, material suppliers, and employees of the Contractor have been paid in full.

D. UNIT PRICE CONSTRUCTION ITEMS

No work shall be performed by the Contractor on any unit price items beyond the quantity as set forth in the Contract, unless specifically approved by the Owner and directed by the Engineer in writing to do so. It is anticipated that the quantities as set forth for such unit price items are reasonable and that said quantities will not be exceeded by more than 10%. The Contractor shall carefully study the Contract Documents to determine the extent and scope of the work included under lump sum items in the Contract. It may be that work under some of such unit price items is in addition to similar work to be performed under lump sum items and paid for thereunder.

E. COMPENSATION FOR EXTRA WORK AND WORK OMITTED

Whenever corrections, additions, or modifications in the work under this Contract change the amount of work to be performed or the amount of compensation due the Contractor, the Owner will have prepared a written Change Order, setting forth the extra work to be performed or work omitted. Such a Change Order will also set forth the method of computing the added or reduced compensation to be due the Contractor. The method of computing the added or reduced compensation will be determined under one or more of the following methods as selected by the Owner:

(1) By Unit Price contained in the Contractor's original Proposal and incorporated in the Contract with a change in quantity.

(2) By a supplemental schedule of prices contained in the Contractor's original Proposal and incorporated in the Contract.

(3) By an acceptable lump sum of the following five items as full and proper compensation:

(a) The necessary reasonable cost to the Contractor of the material required for the work as furnished and delivered by the Contractor at the site of the work.

(b) The necessary cost to the Contractor of the labor required to incorporate all of said material into the work and to finish the work in accordance with directions.

(c) The necessary reasonable cost to the Contractor for the use of equipment used for the work.

(d) The cost of Workers' Compensation, insurance premiums, State Unemployment and Federal Social Security payments on the labor included in Item (b).

(e) Fifteen percent (15%) of the sum of items (a), (b), (c), and (d), which shall be considered as covering all other expenses and profit.

Under method (3) described above, in order that a proper determination may be made by the Engineer of the cost of labor and materials incorporated into extra work, the Contractor shall furnish weekly an itemized statement of material and labor supplied, together with the cost vouchers for quantities and prices of such labor, materials or work. In the event the Contractor fails to comply with the above provisions, no claim for compensation shall be made against the Owner.

F. ACCEPTANCE OF WORK

The work will be accepted in writing by the Owner when completed in accordance with the terms of the Contract Documents as verified by the Engineer. Such acceptance, however, will be predicated upon the approval of State and/or Federal regulatory agencies having concurrent jurisdiction on the work or worksite.

G. FINAL ESTIMATE AND PAYMENT

The Contractor shall, as soon as practicable after the final acceptance of the work under this Contract, submit a final estimate for payment. Such final estimate shall be checked, approved and signed by the Engineer and the Owner. After such approval, the Owner shall pay or cause to be paid to the Contractor the entire sum found to be due after deducting therefrom all previous payments and amounts as the terms of the Contract prescribe.

Neither the final payment nor any part of the retained percentage shall become due until the Contractor shall deliver to the Owner a complete release of all claims or liens arising out of this Contract and an affidavit that, so far as he has knowledge or information, the release includes all the labor and materials for which a lien or claim could be filed. The Contractor may, if a Subcontractor refuses to furnish a release in full, furnish a bond satisfactory for the full amount of the Subcontractor's lien to the Owner indemnifying the Owner against any claim or lien. If any claim or lien remains unsatisfied after all payments are made, the Contractor shall reimburse the Owner all money that it may be compelled to pay in discharging such lien, including all costs and reasonable attorney's fees.

END OF GENERAL PROVISIONS OF CONTRACT

SECTION 0650

ENGINEER'S SUPPLEMENTARY CONDITIONS

SECTION 0650

ENGINEER'S SUPPLEMENTARY CONDITIONS

1.01 PROJECT DESCRIPTION: Upgrades to Chestnut Road Pump Station, in Myrtle Beach, South Carolina.

1.02 DEFINITIONS:

A. Owner: City of Myrtle Beach
Post Office Drawer 2468
Myrtle Beach, SC 29578

B. Engineer: DDC Engineers, Inc.
1298 Professional Drive
Myrtle Beach, SC 29577

1.03 SCOPE OF WORK: The upgrades to the existing Chestnut Road Pump Station. The demolition of the existing Chestnut Pump Station building, removal of the wetwell/drywell existing pumps, controls, etc. Restoration of the existing wetwell/drywall. Construction of a new concrete block control room building, installation of new pumps, controls and electrical work at the existing Chestnut Pump Station site, located north of Myrtle Beach

1.04 PLANS & SPECIFICATIONS: The Contractor will receive five (5) sets of plans and specifications to complete the work. The Contractor will receive three (3) color sets of the Schematic Conduit sheets (SC sheets) to complete this portion of the contract.

1.05 CONSTRUCTION STAKE OUT:

A. Alignment and Control: The Engineer will provide a base line for construction alignment and a benchmark for the elevation datum.

B. Stake Out: The Contractor shall furnish and perform all construction stake out from the Control Points furnished, and shall be totally responsible to construct the work in accordance with the plans and specifications. The Engineer's checking of grade and offset stake out shall in no way relieve the Contractor of this responsibility.

1.06 WORK SCHEDULE: The Contractor shall, upon notice of award, or as otherwise requested, furnish the Engineer a job schedule showing the various components of work and the anticipated beginning and completion date for each particular phase of the project.

1.07 STATE HIGHWAY ENCROACHMENT: The Owner will obtain encroachment permit agreements for all work located in the public rights-of-way, if required. All operations, trenching, pavement butting and repair will be coordinated with the appropriate public agency where such work affects public property. All requirements of these permits shall be performed by the Contractor as though the permits were issued in the name of the Contractor. A copy of the permit will be provided to the Contractor upon request.

1.08 REQUIRED RECORDS ON SALES AND USE TAX: In order that the Owner may substantiate a refund claim for sales and use taxes, the Contractors shall furnish certified statements in triplicate, setting forth the cost of construction materials, supplies and fittings, and equipment which becomes a part

of, or are annexed to any building or structure being erected, altered, or repaired under contract, with the Owner and the amount of sales and/or use taxes paid thereon.

1.09 EXISTING CONDITIONS: The Contractor, in submitting a proposal and in signing this contract, acknowledges that he has thoroughly investigated the existing conditions and has examined the plans and specifications, understanding clearly their requirements and the requirements necessary to construct all to completion the improvements contracted for; that he is fully prepared to sustain all losses and damages incurred by the actions of elements; is prepared to provide all necessary tools, appliances, machinery, skilled and unskilled workmen, and all necessary materials to successfully complete the work. The Contractor should be hereby made aware that he is responsible for working the subgrade by disking, cutting, rolling, mixing or whatever means necessary to obtain desired compaction. If the Contractor has made the necessary efforts to bring said subgrade to compaction, and in the opinion of the Engineer, the subgrade is unsuitable, the Contractor shall be authorized to muck and backfill these areas.

1.10 SITE DRAINAGE: The Contractor is hereby made aware that it shall be the responsibility of the Contractor to provide positive drainage on the site during construction. Temporary drainage ditches, swales or piping required for this purpose must be approved by the Engineer and by the Owner before construction and must be constructed so as not to interfere with traffic, pedestrian and/or vehicular. The cost of de-watering shall be included in the various unit prices stated in the proposal. No additional payment will be made for this work.

1.11 SOILS REPORTS: It shall be the Contractor's responsibility to confirm soil conditions and water table on the site by taking his own samples. This work shall be coordinated with the Owner prior to bidding the project.

1.12 PROJECT SCHEDULE: The Contractor shall complete all work on the project within 120 consecutive calendar days from Notice To Proceed. Liquidated damages of $2,500 per day will be assessed for each consecutive calendar day worked after the completion date.

1.13 ENVIRONMENTAL REGULATIONS: Contractor is responsible for ensuring that his forces comply with environmental regulations on site. Should construction forces violate laws, ordinances or regulations causing delays or adverse consequences on the site, the Contractor shall be held responsible for said actions.

1.14 UNIT PRICES: Unit prices in the bid package are to be used only in paying for items that are added or deducted from the Contract during construction. These Unit prices will be used in the preparation of the necessary change orders. This contract will be awarded as a Lump Sum Contract.

1.15 LIST OF DRAWINGS: The following drawings are included as part of this contract:

<u>Upgrades to Chestnut Road Pump Station</u>:

Sheet	1	of	11	Cover Sheet
Sheet	2	of	11	Existing Conditions Site Plan
Sheet	3	of	11	Existing Conditions Pump Station
Sheet	4	of	11	Demolition Site Plan
Sheet	5	of	11	Demolition Pump Station
Sheet	6	of	11	Proposed Site Plan
Sheet	7	of	11	Proposed Pump Station
Sheet	8	of	11	Proposed Pump Station Building
Sheet	9	of	11	Proposed Pump Station Building

Sheet	10	of	11	General Details
Sheet	11	of	11	Miscellaneous Details

1.16 CONSTRUCTION STAGING AREA: The Construction Staging Area for this Project will be located at the discretion of the Contractor with prior written consent by the Owner. The Contractor shall not presume to be able to use City right-of-ways and property for construction staging without prior written consent of the Owner.

1.17 RESOLUTION OF CLAIMS AND DISPUTES: The Engineer will review claims and take one or more of the following preliminary actions within ten (10) calendar days of receipt of a claim: (1) Request additional supporting data from the claimant; (2) Submit a schedule to the parties indicating when the Engineer expects to take action; (3) Reject the claim in whole or in part, stating the reason for rejection; (4) Recommend approval of claim by the other party or (5) Suggest a compromise. The Engineer may also, but is not obligated to, notify the surety, if any, of the nature and amount of the claim.

If a claim has been resolved, the Engineer will prepare or obtain appropriate documentation.

If a claim has not been resolved, the party making the claim shall, within ten (10) days after the Engineer's preliminary response, take one (1) or more of the following actions: (1) Submit additional supporting data requested by the Engineer; (2) Modify the initial claim or (3) Notify the Engineer that the initial claim stands.

If a claim has not been resolved after consideration of the foregoing and of further evidence presented by the parties or requested by the Engineer, the Engineer will notify the parties in writing that the Engineer's decision will be made within seven (7) days, which decision shall be final and binding on the parties but subject to resolution through the South Carolina judicial system. Upon expiration of such time period, the Engineer will render to the parties the Engineer's written decision relative to the claim, including any change in Contract Sum or Contract Time or both. If there is a surety and there appears to be a possibility of a Contractor's default, the Engineer may, but is not obligated to, notify the surety and request the surety's assistance in resolving the controversy.

When functioning as interpreter and judge under the preceding paragraphs, the Engineer will not show partiality to Owner or Contractor and will not be liable in connection with any interpretation or decision rendered in good faith in such capacity.

1.18 ESCALATION: No provision for price escalation is included in the project. Contractor shall be solely responsible for any cost of materials increases or other cost increases that may occur after bids have been submitted. The Owners will be under no obligation to consider contractor justifications of any increase in cost of materials, etc.

1.19 PRIVATE PROPERTY: The Contractor shall not (except after written consent from the proper parties) enter or occupy with men, tools, or materials, any land outside the rights-of-way or property of the Owner. A copy of the written consent shall be given to the Engineer.

1.20 PRIVATE PROPERTY OWNER COORDINATION: The Contractor shall make contact with all private property owners and business operators during the construction of this project. This contact will be to inform them of the impacts this project will have on their property. This task shall not be the responsibility of the Owner, the Engineer, Santee Cooper, or any of the other utility companies to perform. The Owner, Engineer, and/or Santee Cooper may have a representative accompany the Contractor during this process, at their discretion. The Contractor shall coordinate all of their construction efforts with the appropriate private property owners during construction, and shall keep them apprised of

the contractor's schedule regarding work on and around their property. If the Contractor's onsite Superintendent is not a suitable representative for this public interface, the Contractor shall provide an alternate suitable representative for this task at no additional cost to the Owner. It is the Contractor's responsibility to work with the public to successfully complete this project. Lack of proper coordination with the public will be considered a breach of this contract, resulting in a project stoppage until this issue is addressed to the Owner's satisfaction.

END OF SECTION

SECTION 0700

CONTRACT FORMS

AGREEMENT

FOR

Upgrades to Chestnut Road Pump Station

This AGREEMENT, made this _____ day of _____, 20___, by and between City of Myrtle Beach, hereinafter called "OWNER", and_____, doing business as [a sole proprietorship], [a partnership], [or a corporation], hereinafter called "CONTRACTOR".

WITNESSETH: That for and in consideration of the payments and agreements hereinafter mentioned:

1. The CONTRACTOR will commence and complete the construction of the Upgrades to Chestnut Road Pump Station, hereinafter called "PROJECT".

2. The CONTRACTOR will furnish all of the material, supplies, tools, equipment, labor and other services necessary for the construction and completion of the PROJECT described herein.

3. The CONTRACTOR will commence the work required by the CONTRACT DOCUMENTS within Ten (10) calendar days after the date of the NOTICE TO PROCEED in keeping with the following schedule, and will complete the work not later than the completion dates as listed in the following schedule, or unless the period for completion is extended otherwise by the CONTRACT DOCUMENTS.

4. The CONTRACTOR agrees to perform all of the WORK described in the CONTRACT DOCUMENTS and comply with the terms therein for the Lump Sum of $_____ _____(Dollars) as shown in the BID schedule.

5. The term "CONTRACT DOCUMENTS" means and includes the following:

   A. Notice to Bidders

   B. Instructions to Bidders

   C. Proposal

   D. Bid Bond

   E. Agreement

   F. General Provisions

   G. Engineer's Supplementary Conditions

   H. Contract Forms - Payment/Performance Bonds
      - Insurance Certificates
      - Notice of Award
      - Notice to Proceed
      - Change Orders

I. GENERAL REQUIREMENTS prepared or issued by:
DDC Engineers, Inc.

J. TECHNICAL SPECIFICATIONS prepared or issued by:
DDC Engineers, Inc.

K. ADDENDA:
No. _____, Dated:

L. CONTRACT DRAWINGS prepared by DDC Engineers, Inc., numbered and dated as noted on the cover sheet.

6. The OWNER will pay to the CONTRACTOR in the manner and at such times and in such amounts as required by the CONTRACT DOCUMENTS.

7. This Agreement shall be binding upon all parties hereto and their respective heirs, executors, administrators, successors, and assigns.

8. CONTRACTOR agrees to commence WORK under the contract on or before a date specified in the NOTICE TO PROCEED and to fully complete the PROJECT within 120 consecutive calendar days. CONTRACTOR further agrees to pay as liquidated damages, the sum of $2,500.00 for each consecutive calendar day thereafter as provided in the Contract Document.

IN WITNESS WHEREOF, the parties hereto have executed, or caused to be executed by their duly authorized officials, this Agreement in four (4) counter parts, each of which shall be deemed an original on the date first above written.

CITY OF MYRTLE BEACH:

_____

BY: _____

Name: _____

Title: _____

(SEAL)

ATTEST:

_____

TITLE: _____

CONTRACTOR

BY: _____

Name: _____

Title: _____

(SEAL)

ATTEST:

_____

TITLE: _____

NOTICE OF AWARD

To: _____
_____
_____

PROJECT Description:

Upgrades to Chestnut Road Pump Station

The OWNER has considered the BID submitted by you for the above described WORK in response to its Notice to Bidders dated _____ and Instruction to Bidders.

You are hereby notified that your Lump Sum BID has been accepted for items in the amount of: _
_____ and no/100 dollars)

You are required by the Instruction to Bidders to execute the Agreement and furnish the required CONTRACTOR'S Performance BOND, Payment BOND, and certificates of insurance within ten (10) calendar days from the date of this Notice to you.

If you fail to execute said Agreement and to furnish said BONDS within ten (10) days from the date of this Notice, said OWNER will be entitled to consider all your rights arising out of the OWNER'S acceptance of your BID as abandoned and as a forfeiture of your BID BOND. The OWNER will be entitled to such other rights as may be granted by law.

You are required to return an acknowledged copy of this NOTICE OF AWARD to the OWNER.

Dated this _____ day of _____, 20 ____.

The City of Myrtle Beach
Owner

By _____

Title _____

ACCEPTANCE OF NOTICE
Receipt of the above NOTICE OF AWARD is hereby acknowledged

By: _____

This the _____ day of _____, 20___.

By: _____ Title: _____

PAYMENT BOND

KNOW ALL MEN BY THESE PRESENTS: that

_____
(Name of Contractor)

_____
(Address of Contractor)

a _____ hereinafter called Principal, and
(Corporation, Partnership or Individual)

_____
(Name of Surety)

_____
(Address of Surety)

hereinafter called Surety, are held and firmly bound unto _____

_____
(Name of Owner)

_____
(Address of Owner)

hereinafter called OWNER, in the penal sum of _____ Dollars, ($_____) in lawful money of the United States, for the payment of which sum well and truly to be made, we bind ourselves, successors, and assigns, jointly and severally, firmly by these presents.

THE CONDITION OF THIS OBLIGATION is such that whereas, the Principal entered into a certain contract with the OWNER, dated the _____ day of _____, 20_____, a copy of which is hereto attached and made a part hereof for the construction of:

Upgrades to Chestnut Road Pump Station

NOW, THEREFORE if the Principal shall promptly make payment to all persons, firms, SUBCONTRACTORS, and corporations furnishing materials for or performing labor in the prosecution of the WORK provided for in such contract, and any authorized extension or modification thereof, including all amounts due for materials, lubricants, oil, gasoline, coal and coke, repairs on machinery, equipment and tools, consumed or used in connection with the construction of such WORK whether by SUBCONTRACTOR or otherwise, then this obligation shall be void; otherwise to remain in full force and effect.

PROVIDED, FURTHER, that the said Surety for value received hereby stipulates and agrees that no change, extension of time, alteration or addition to the terms of the contract or to the WORK to be performed thereunder or the SPECIFICATIONS accompanying the same shall in any wise affect its obligation on this BOND, and it does hereby waive notice of any such change, extension of time, alteration or addition to the terms of the contract or to the WORK or to the SPECIFICATIONS.

PROVIDED, FURTHER, that no final settlement between the OWNER and the CONTRACTOR shall abridge the right of any beneficiary hereunder, whose claim may be unsatisfied.

IN WITNESS WHEREOF, this instrument is executed in four (4) counterparts, each one of which shall be deemed an original, this the _____ day of _____, 20 ___.

ATTEST:

_____
Principal

_____
(Principal) Secretary

[SEAL] By_____(S)

_____
(Address)

_____

_____
Witness as to Principal

_____
(Address)

_____ _____
Surety

ATTEST: By _____
Attorney-in-Fact

_____ _____
Witness as to Surety (Address)

_____ _____
(Address)

_____

NOTE: Date of BOND must not be prior to date of Contract.
If CONTRACTOR is Partnership, all partners should execute BOND.

IMPORTANT: Surety companies executing BONDS must appear on the Treasury Department's most current list (Circular 570 as amended) and be authorized to transact business in the State where the PROJECT is located.

PERFORMANCE BOND

KNOW ALL MEN BY THESE PRESENTS: that

_____
(Name of Contractor)

_____
(Address of Contractor)

a _____ hereinafter called Principal, and
(Corporation, Partnership, or Individual)

_____
(Name of Surety)

_____
(Address of Surety)

hereinafter called SURETY, are held and firmly bound unto _____

_____
(Name of Owner)

_____
(Address of Owner)

hereinafter called OWNER, in the penal sum of _____

_____Dollars, ($_____)

in lawful money of the United States, for the payment of which sum well and truly to be made, we bind ourselves, successors, and assigns, jointly and severally, firmly by these presents.

THE CONDITION OF THIS OBLIGATION is such that whereas, the Principal entered into a certain contract with the OWNER, dated the _____ day of _____, 20___, a copy of which is hereto attached and made a part hereof for the construction of:

Upgrades to Chestnut Road Pump Station

NOW, THEREFORE, if the Principal shall well, truly and faithfully perform its duties, all the undertakings, covenants, terms, conditions, and agreements of said contract during the original term thereof, and any extensions thereof which may be granted by the OWNER, with or without notice to the Surety and during the one year guaranty period, and if he shall satisfy all claims and demands incurred under such contract, and shall fully indemnify and save harmless the OWNER from all costs and damages which it may suffer by reason of failure to do so, and shall reimburse and repay the OWNER all outlay and expense which the OWNER may incur in making good any default, then this obligation shall be void; otherwise to remain in full force and effect.

PROVIDED, FURTHER, that the said surety, for value received hereby stipulates and agrees that no change, extension of time, alteration or addition to the terms of the contract or to WORK to be performed thereunder or the SPECIFICATIONS accompanying the same shall in any wise affect its obligation on this BOND, and it does hereby waive notice of any such change, extension of time, alteration or addition to the terms of the contract or to the WORK or to the SPECIFICATIONS.

PROVIDED, FURTHER, that no final settlement between the OWNER and the CONTRACTOR shall abridge the right of any beneficiary hereunder, whose claim may be unsatisfied.

IN WITNESS WHEREOF, this instrument is executed in four (4) counterparts, each one of which shall be deemed an original, this the _____ day of _____, 20 ____.

ATTEST:

_____
Principal

_____
(Principal) Secretary

By _____(s)

[SEAL]

_____
(Witness as to Principal)

_____
(Address)

_____
(Address)

_____
Surety

ATTEST:

_____
(Surety) Secretary

[SEAL]

_____
Witness as to Surety

By _____
Attorney-in-Fact

_____
(Address)

_____
(Address)

NOTE: Date of Bond must not be prior to date of Contract.
If CONTRACTOR is Partnership, all partners should execute BOND.
IMPORTANT: Surety companies executing BONDS must appear on the Treasury Department's most current list (Circular 570 as amended) and be authorized to transact business in the state where the PROJECT is located.

NOTICE TO PROCEED

To: _____ Date: _____

_____

_____

Project: Upgrades to Chestnut Road Pump Station

You are hereby notified to commence WORK in accordance with the Agreement dated_____, 20 _____, on or before _____, 20____, and you are to complete the work within 120 consecutive calendar days:

The City of Myrtle Beach
Owner

By _____

Title _____

ACCEPTANCE OF NOTICE

Receipt of the above NOTICE TO PROCEED is hereby acknowledged by:

_____

this the _____ day of

_____, 20_____.

_____

By _____

Title _____

CHANGE ORDER

Order No. _____
Date: _____
Agreement Date: _____

NAME OF PROJECT: _____

OWNER: _____

CONTRACTOR: _____

The following changes are hereby made to the CONTRACT DOCUMENTS:

Justification:

Change to CONTRACT PRICE:

Original CONTRACT PRICE: $ _____.

Current CONTRACT PRICE adjusted by previous CHANGE ORDER: $ _____.

The CONTRACT PRICE due to this CHANGE ORDER will be (increased) (decreased) by: $ _____.

The new CONTRACT PRICE including this CHANGE ORDER will be: $ _____.

Change to CONTRACT TIME:

The CONTRACT TIME will be (increased) (decreased) by _____ calendar days.

The date for completion of all work will be _____ (Date).

Approvals Required:

To be effective this Order must be approved by the funding agency if it changes the scope or objective of the PROJECT, or as may otherwise be required by the GENERAL PROVISIONS or ENGINEER'S SUPPLEMENTARY CONDITIONS.

Recommended: _____
Construction Manager

Approved: _____
Engineer

Agreed To: _____
Contractor

Authorized: _____
Owner

Agency(ies) Approval(s): _____

(Where applicable): _____

APPLICATION FOR PAYMENT FORM

_____ OWNER

PERIODIC ESTIMATE FOR PARTIAL PAYMENT NO. _____ CONTRACT NO. _____
PROJECT: _____ SHEET ____ OF ____ SHEETS
FOR THE PERIOD _____ TO _____ INCLUSIVE PROJECT NO. _____
CONTRACTOR'S NAME AND ADDRESS: _____
CONTRACT PRICE [LUMP SUM]: $_____ ESTIMATED COST [UNIT PRICE]: $_____

	NO. AND DESCRIPTION OF UNIT			WORK PERFORMED TO DATE		
ITEM NO. (1).	DETAILED ESTIMATE (2)	UNIT PRICE (3)	COST ESTIMATED (4)	NO OF UNITS (5)	AMOUNT EARNED TO DATE (6)	% COMPLETE (7)
	Future Items					
	Materials Stored on Site (For Detailed Breakdown See Attached Supplement)					
		TOTALS				

CERTIFICATE OF THE CONTRACTOR OR HIS DULY AUTHORIZED REPRESENTATIVE

To the best of my knowledge and belief, I certify that all items, units, quantities, and prices of work and material shown on the face of Sheet(s) _____ of this Periodical Estimate are correct, that all work has been performed and materials supplied in full accordance with the terms and conditions of the corresponding construction contract documents between the undersigned as Contractor and _____ as Owner, dated: _____, and all authorized changes thereto; that the following is a true and correct statement of the contract account up to and including the last day of the period covered by this estimate and that no part of the "Total Amount Due" has been received;

(a)	Total amount earned (col. 6).....	$_____
(b)	Retained Percentage (10%).....	$_____
(c)	Total earned less retained percentage.....	$_____
(d)	Total previously certified [Line (c) from previous estimate No. _____).....	$_____
(e)	Amount due this estimate.....	$_____
(f)	Excess cost of field engineering and inspection.....(Subtract)	$_____
(g)	Total Amount Due.....	$_____

I further certify that all claims outstanding as of this date against the undersigned as Contractor for labor, materials, and expendable equipment employed in the performance of said contract up to this date have been paid in full in accordance with the requirements of said contract.

CONTRACTOR: _____ Date: _____

By: _____ Title: _____

CERTIFICATE OF THE OWNER'S CONSULTING ENGINEERS

I certify that I have verified this Periodical Estimate, and that to the best of my knowledge and belief it is a true and correct statement of work performed and materials supplied under the Contract, and that the Contractor's certified statement of his account and the amount due him is correct and just, and that all work and material included in this Periodical Estimate have been performed in full accordance with the terms and conditions of the corresponding construction contract documents and authorized changes thereto.

Name: _____

By: _____ Resident Engineer

Date: _____

OWNER'S RECOMMENDATION FOR PAYMENT

Approved and Payment Recommended:

_____OWNER

By: _____

Title: _____

DIVISION 1

GENERAL REQUIREMENTS

SECTION 01000

COORDINATION AND MEETINGS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Coordination.

B. Field Engineering.

C. Alteration of Project Procedures.

D. Preconstruction Conference.

1.2 COORDINATION

A. Coordinate scheduling, submittals, and Work of the various Sections and Specifications to assure efficient and orderly sequence of installation of interdependent construction elements.

B. Coordinate regular meetings with Engineer and Owner's Project Manager to discuss job progress, amendments, change orders, and conflicts. Meetings shall be held a minimum of every two weeks, and more frequently as project conditions warrant.

C. Contractor is responsible for coordination of materials, delivery for general and subcontractors, and shall ensure that there is no interference between trades on the project which would jeopardize expedient completion of the project.

D. Coordinate completion and site work clean up between all subcontractors to ensure that the job site is properly maintained.

E. After Owner occupancy of premises, coordinate access to site for correction of defective Work and Work not in accordance with Contract Documents, to minimize disruption of Owner's activities.

F. Attend periodic meetings with adjoining property owners, business operators, and concerned citizens, to answer questions, hear concerns, and to apprise as to the status of the work and the schedule for upcoming construction activities. Such meetings can be expected to occur on average and as frequently as once every two weeks during the construction period(s). The Engineer and the Owner's Project Manager will be responsible for scheduling and chairing such meetings, and for arranging meeting locations.

1.3 FIELD ENGINEERING

A. Owner will locate survey control and reference points.

B. Contractor shall provide field engineering services, establish elevations, lines and levels, utilizing recognized engineering survey practices.

1.4 ALTERATION OF PROJECT PROCEDURES

A. Materials: Submittals to the Engineer must be approved in writing before any materials may be substituted or altered.

1.5 PRECONSTRUCTION CONFERENCE

A. Engineer will schedule a preconstruction conference after the Notice of Award is executed.

B. Attendance Required: Owner, Engineer's Project Manager and Inspector, Contractor and his Project Superintendent.

C. Agenda:

1. Execution of Owner-Contractor Agreement.
2. Submission of executed bonds and insurance certificates.
3. Distribution of Contract Documents.
4. Submission of shop drawings and other submittal data regarding materials, methods of construction.
5. Designation of personnel representing the parties in Contract and the Engineer.
6. Procedures and processing of field decisions, submittals, substitutions, applications for payments, proposal request, Change Orders and Contract closeout procedures.
7. Scheduling.

END OF SECTION

SECTION 01050

APPLICATIONS FOR PAYMENT PROCEDURES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Procedures for preparation and submittal of Applications for Payment.

1.2 RELATED SECTIONS

A. Section 0550 - General Provisions

B. Section 0650 - Supplemental Conditions

C. Section 0700 - Contract Forms

D. Section 1060 - Change Order Procedures

E. Section 1700 - Contract Closeout

1.3 FORMAT

A. Application for Payment Form: Use form provided in the Contract Forms, Section 0700

1.4 PREPARATION OF APPLICATIONS

A. Present required information in typewritten form.

B. Execute certification by signature of authorized officer.

C. Use data from approved Schedule of Values. Provide dollar value in each column for each line item for portion of work performed and for stored Products.

D. List each authorized Change Order listing Change Order number and dollar amount as for an original item of Work. Include a copy of approved change order form.

F. Prepare Application for Final Payment as specified in Section 1700.

1.5 SUBMITTAL PROCEDURES

A. Submit three (3) signed hard copies of each Application for Payment to the Engineer, and one (1) digital copy of Application emailed to Owner's Project Manager and Engineer.

1.6 SUBSTANTIATING DATA

A. When Engineer requires substantiating information, submit data justifying dollar amounts in question.

B. Provide one copy of data with cover letter for each copy of submittal. Show Application number and date, and line item by number and description.

END OF SECTION

SECTION 01060

CHANGE ORDER PROCEDURES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Submittals.

B. Documentation of change in contract Sum/Price and Contract Time.

C. Change order procedures.

D. Construction Change Authorization.

E. Unit price change orders.

F. Execution of change orders.

G. Correlation of Contractor submittals.

1.2 RELATED SECTIONS

A. Section 0550 - General Provisions.

B. Section 0650 – Engineers Supplemental Conditions.

C. Section 0700 - Contract Forms.

D. Section 1050 - Applications for Payment Procedures.

E. Section 1700 - Contract Closeout.

1.3 SUBMITTALS

A. Submit name of the individual authorized to receive change documents, and be responsible for informing others in Contractor's employ or Subcontractors of changes to the Work.

B. Change Order Forms: Use form provided in bid documents.

1.4 DOCUMENTATION OF CHANGE IN CONTRACT SUM/PRICE AND CONTRACT TIME

A. Maintain detailed records of work done on time and material basis. Provide full information required for evaluation of proposed changes, and to substantiate costs of changes in the Work. Submit all claims for time and materials changes within thirty (30) days of the additional work, for review by the Owner and Engineer.

B. Document each quotation for a change in cost or time with sufficient data to allow evaluation of the quotation.

C. On request, provide additional data to support computations:

1. Quantities of products, labor, and equipment.
2. Taxes, insurance, and bonds.
3. Overhead and profit.
4. Justification for any change in Contract time.
5. Credit for deletions from Contract, similarly documented.

D. Support each claim for additional costs, and for work done on a time and material basis, with additional information:

1. Origin and date of claim.
2. Dates and times work was performed, and by whom.
3. Time records and wage rates paid.
4. Invoices and receipts for products, equipment, and subcontracts, similarly documented.

1.5 CHANGES IN PROCEDURES

A. The Engineer will advise of minor changes in the Work not involving an adjustment to Contract Sum/Price or Contract Time.

B. The Engineer may issue a Notice of Change which includes a detailed description of a proposed change with supplementary or revised Drawings and specifications, a change in Contract Time for executing the change with a stipulation of any overtime work required and the period of time during which the requested price will be considered valid. Contractor will prepare and submit an estimate within 10 days.

1.6 CONSTRUCTION CHANGE AUTHORIZATION

A. Engineer may issue a directive, signed by the Owner, instructing the Contractor to proceed with a change in the Work, for subsequent inclusion in a Change Order.

B. The document will describe changes in the Work, and will designate method of determining any change in Contract Sum/Price or Contract Time.

C. Promptly execute the change in Work.

1.7 UNIT PRICE CHANGE ORDER

A. For predetermine unit prices and quantities, the Change Order will be executed based on the fixed unit prices in the proposal.

B. For unit costs or quantities of units of work which are not predetermined, execute Work under a construction Change Authorization.

1.8 EXECUTION OF CHANGE ORDERS

A. Execution of Change Orders: Engineer will issue Change Orders for signatures of parties as provided in the General Provisions of the Contract.

1.9 CORRELATION OF CONTRACTOR SUBMITTALS

A. Promptly revise Schedule of Values and Application for Payment forms to record each authorized Change Order as a separate line item and adjust the Contract Sum/Price.

B. Promptly revise progress schedules to reflect any change in Contract Time, revise sub-schedules to adjust time for other items of work affected by the change, and resubmit.

C. Promptly enter changes in Project Record Documents.

END OF SECTION

SECTION 01300

SUBMITTALS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Submittal procedures, control of installation.

B. Proposed Products list.

C. Proposed data.

D. Manufacturers' instructions.

E. Manufacturers' certificates.

F. Shop Drawings.

G. Samples.

1.2 RELATED SECTIONS

A. Section 01700 - Contract Closeout.

1.3 SUBMITTAL PROCEDURES

A. Transmit each submittal to the Engineer for approval.

B. Identify Project, Contractor, Subcontractor, or Supplier; pertinent drawing sheet and detail number(s), and specification section number, as appropriate.

C. Submit all submittals complete. No partial submittals will be accepted. Provide certification with submittals signed by and sealed by a Registered Professional Engineer certifying that all equipment proposed is in complete accordance with and is fully coordinated with the Contract Documents, without exception. Shop drawings will not be reviewed without this certification attached, and if submitted without this certification will be returned disapproved.

D. Identify system limitations which may be detrimental to successful performance of the completed work.

E. Provide space for Engineer review stamps.

F. Revise and resubmit submittals as required, identify all changes made since previous submittal.

G. Distribute copies of review submittals to concerned parties. Instruct parties to promptly report any inability to comply with provisions.

1.4 PRODUCT DATA AND SHOP DRAWINGS

A. Submit the number of copies which the Contractor requires, plus two copies which will be retained by the Engineer.

B. Mark each copy to identify applicable products, models, options, and other data. Supplement manufacturers' standard data to provide information unique to this Project.

C. After review, distribute in accordance with Article on Procedures above and provide copies for Record Documents described in Section 1700 - Contract Closeout.

1.5 SAMPLES

A. Submit samples for the Engineer's visual review of general generic kind, color, pattern, and texture, a final check of the coordination of these characteristics with other related elements of the Work, and for quality control comparison of these characteristics between the final sample submittal and the actual Work as it is delivered and installed. Refer to individual Sections of these specifications for specific sample requirements which may be intended for examination or testing of additional characteristics. Compliance with other required characteristics is the exclusive responsibility of the Contractor.

B. Documentation required specifically for sample submittals includes a generic description of the sample, the sample source or the product name or manufacturer, compliance with governing regulations and recognized standards. In addition, indicate limitations in terms of availability, sizes, delivery time, and similar limiting characteristics.

C. Preparation: Where possible, provide full scale, fully fabricated samples cured and finished in the manner specified that are physically identical with the proposed material or product to be incorporated in the work. Where variations in color, pattern, or texture are inherent in the material or product represented by the sample, submit multiple units of the sample (not less than 3 units), which show the approximate limits of variations. Where samples are specified for the Engineer's selection of color, texture or pattern, submit a full set of available choices for the material or product. Mount, display, or package samples in the manner specified to facilitate the review of indicated qualities. Prepare samples to match the Engineer's sample where so indicated.

D. Submit 3 sets of samples: one set will be returned.

E. Distribution of Samples: Maintain the final submittal sets of samples, as returned by the Engineer at the project site, available for quality control comparisons throughout the course of performing the Work.

1.6 MANUFACTURER'S INSTRUCTIONS

A. When specified in individual specification Sections, submit manufacturers' printed instructions for delivery, storage, assembly, installation, start-up, adjusting, and finishing, in quantities specified for Product Data.

1.7 MANUFACTURER'S CERTIFICATES

A. When specified in individual specification Sections, submit manufacturer's certificate to Engineer for review, 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 of previous test results on material or Product, or as specified in other sections, but must be acceptable to Engineer.

1.8 MOCK-UPS

A. Special forms of samples, which are too large or otherwise inconvenient for handling in the manner specified for transmittal of sample submittals.

B. Mock-ups and similar samples specified in individual Sections are special types of samples. Comply with sample submittal requirements to the fullest extent possible. Process transmittal forms to provide a record of activity.

END OF SECTION

SECTION 01310

CONSTRUCTION SCHEDULES

PART 1 GENERAL

1.1 DESCRIPTION

A. Work Included: To assure adequate planning and execution of the Work so that the Work is completed within the time frame established in the Contract, and to assist the Engineer in evaluating progress of the Work, prepare and maintain the schedule and reports described in this Section.

B. Related Work:

1. Documents affecting work of this Section include, but are not necessarily limited to, General Provisions, Supplementary Conditions and General Requirements of these Specifications.

2. Construction Period: Owner - Contractor Agreement.

1.2 QUALITY ASSURANCE

A. Employ a scheduler who is thoroughly trained and experienced in compiling construction schedule data, and in preparing and issuing periodic reports as required below.

B. Perform data preparation, analysis, charting, and updating in accordance with standards accepted by the Engineer.

C. Reliance upon the Schedule:

1. The construction schedule will be an integral part of the Contract and will establish interim completion dates for the various activities under the Contract.

2. Should any activity not be completed within 15 calendar days after the stated schedule date, the Owner shall have the right to require the Contractor to expedite completion of the activity by whatever means the Owner deems appropriate and necessary, without additional compensation to the Contractor.

3. Should any activity be 30 calendar days or more behind schedule, the Owner shall have the right to perform the activity or have the activity performed by whatever method the Owner deems appropriate.

4. Costs incurred by the Owner and by the Engineer in connection with expediting construction activity under this Article shall be reimbursed by the Contractor.

5. It is expressly understood and agreed that failure by the Owner to exercise the option, either to order the Contractor to expedite an activity, or to expedite the activity by other means, shall not be considered to set a precedent for any other activities, and shall not relieve the Contractor from performing the Work within the time frame established in the Contract.

1.3 SUBMITTALS

A. Construction Schedule: Within ten (10) calendar days after the Contractor has received the Owner's Notice to Proceed, submit one (1) reproducible copy and four (4) prints of the construction schedule prepared in accordance with Part 3 of this Section. Also, please submit one copy of the schedule, in color, on a 24" x 36" sheet of paper. This schedule shall be materially the same as the preliminary Construction Schedule submitted with Bid Proposal.

B. Periodic Reports: On the first working day of each month following the submittal described in Paragraph 1.3-A above, submit four (4) prints of the construction schedule updated as described in 1.5 of this Section.

1.4 CONSTRUCTION SCHEDULE

A. In the form of an industry-accepted standard CPM Construction Schedule, graphically show by bar-chart the order and interdependence of all activities necessary to complete the Work, and the sequence in which each activity is to be accomplished. Schedule shall be planned by the Contractor and his project field superintendent in coordination with all subcontractors whose work is required to complete the Work.

B. Include, but do not necessarily limit indicated activities to:
   1. Project mobilization;
   2. Submittal and approval of Shop Drawings and Samples;
   3. Preparation of mock-ups;
   4. Procurement of equipment and critical materials;
   5. Fabrication of special material and equipment, and its installation and testing;
   6. Phasing time frames;
   7. Final clean up;
   8. Final inspecting and testing; and
   9. All activities by the Owner and Engineer that effect progress, with required date for completion, for all and each part of the Work.

C. As soon as practicable after receipt of Notice to Proceed, update the construction analysis in preliminary form, meet with the Engineer and Owner to review contents of the proposed construction schedule, and then make all revisions agreed upon.

D. Submit in Accordance with Paragraph 1.3-A above.

1.5 PERIODIC REPORTS

A. As required under Paragraph 1.3-B above, update the approved construction schedule.

1. Indicate "actual" progress in percent completion for each activity;
2. Provide written narrative summary of revisions causing delay in the program, and an explanation of corrective actions taken or proposed to return the Project to original schedule.

END OF SECTION

SECTION 01400

QUALITY CONTROL

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Quality assurance and control of installation.

B. References.

C. Inspection and testing laboratory services.

1.2 RELATED SECTIONS

A. Section 02100 – Excavation.

1.3 QUALITY ASSURANCE/CONTROL OF INSTALLATION

A. Monitor quality control over suppliers, manufacturers, Products, services, site conditions and workmanship to produce Work of specified quality.

B. Comply fully with manufacturers' instructions, including each step in sequence.

C. Should manufacturers' instructions conflict with Contract Documents, request clarification from Engineer before proceeding.

D. Comply with specified standards as a minimum quality for the Work except when more stringent tolerances, codes, or specified requirements indicate higher standards or more precise workmanship.

E. Perform work by persons qualified to produce workmanship or specified quality.

F. Secure Products in place with positive anchorage devices designed and sized to withstand stresses, vibration, physical distortion or disfigurement.

1.4 REFERENCES

A. Should specified reference standards conflict with Contract Documents, request clarification from Engineer before proceeding.

B. The contractual relationship of the parties to the Contract shall not be altered from the Contract Documents by mention or inference otherwise in any referenced document.

1.5 INSPECTION AND TESTING LABORATORY SERVICES

A. The Contractor shall employ and pay for the services of an independent firm to perform inspection and testing as required by the contract documents or the Engineer. Said firm

shall certify as to the acceptability of the work and shall provide a written report signed and sealed by a Registered Professional Engineer.

B. The independent firm shall perform inspections, tests, and other services specified in individual specification sections and as required by the Engineer. The Owner may retain additional experts to confirm test results.

C. Reports shall be submitted by the independent firm to the Engineer and Owner indicating observations and results of tests, and indicating compliance or non-compliance with Contract Documents.

D. Testing company shall fully cooperate with Engineer, and shall furnish samples of materials, design mix, equipment, tools, storage and assistance as requested.

1. Notify Owner and Engineer 24 hours prior to expected time for operations requiring services.

E. Retesting required where initial tests reveal non-conformance to specified requirements shall be performed by the same independent firm on instructions by the Engineer and paid for by the Contractor.

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

Not Used

END OF SECTION

SECTION 01410

TESTING AND LABORATORY SERVICES

PART 1 GENERAL

1.01 SECTION INCLUDES

1. Contractor shall employ and pay for the services of an Independent Testing Laboratory to perform services and testing specified in the Contract Documents.

2. Employment of laboratory shall in no way relieve Contractor's obligations to perform the Work of the Contract.

3. Provide testing for subgrade, base, and asphalt paving.

1.02 RELATED SECTIONS

A. Section 02200 - Backfilling.

B. Section 02400 - Asphaltic Concrete Pavement.

C. Section 02410 - Patching Asphaltic Concrete Pavement.

D. Section 02420 - Concrete Curb & Gutter and Sidewalk.

E. Section 03250 - Concrete.

1.03 QUALIFICATIONS OF LABORATORY

A. Meet "Recommended Requirements for Independent Laboratory Qualification", published by American Council of Independent Laboratories.

B. Authorized to operate in the State in which the Project is located.

1.04 AUTHORITY AND DUTIES OF LABORATORY

A. Provide qualified personnel after due notice.

B. Perform specified inspections, sampling and testing of materials and methods of construction.

C. Promptly notify Owner and Contractor of observed irregularities or deficiencies of work or products.

D. Laboratory is not authorized to:

1. Release, revoke, alter or enlarge on requirements of Contract Documents.
2. Approve or accept any portion of the Work.
3. Perform any duties of the Contractor.

E. Promptly submit written report of each test and inspection: one copy to Owner, one copy to Engineer, and one copy to Contractor. Each report shall include:

1. Date issued.
2. Project title and number.
3. Testing laboratory name, address, and telephone number.
4. Name and signatures of laboratory inspector.
5. Date and time of sampling or inspection.
6. Record of temperature and weather conditions.
7. Date of test.
8. Identification of product and Specification Section.
9. Location of sample or test in Project.
10. Type of inspection or test.
11. Results of tests and compliance with Contract Documents.
12. Interpretation of test results that indicate unsatisfactory conditions.

1.05 CONTRACTOR'S RESPONSIBILITIES

1. Cooperate with laboratory personnel and provide access to Work.
2. Deliver to laboratory adequate quantities of representative samples of materials proposed for use and which require testing.
3. Notify laboratory sufficiently in advance of operations (minimum of 2 days) to allow for laboratory assignment of personnel and scheduling of tests.
4. Furnish incidental labor and facilities:
   a. To provide access to Work to be tested.
   b. To obtain and handle samples at Project site or at source of product to be tested.
   c. To facilitate inspections and tests.
5. Make arrangements with laboratory and pay for additional samples and tests required for Contractor's convenience.

1.06 REFERENCES

1. ASTM C 31 - Making and Curing Concrete Test Specimens in the Field.

2. ASTM C 39 - Compressive Strength of Cylindrical Concrete Specimens.

3. ASTM C 94 - Ready-Mixed Concrete.

4. ASTM C 143 - Slump of Portland Cement Concrete.

5. ASTM C 172 - Sampling Fresh Concrete.

6. ASTM C 231 - Test for Air Content of Freshly Mixed Concrete by Pressure Method.

7. ASTM D 698 - Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft).

8. ASTM D 1556 - Density and Unit Weight of Soil in Place by the Sand-Cone Method.

9. ASTM D 1557 - Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft).

10. ASTM D 2922 - Density of Soil and Soil-Aggregate in Place by Nuclear Methods.

11. ASTM D 3017 - Water Content of Soil and Rock in Place by Nuclear Methods.

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

3.01 INSPECTION AND CONTROL OF CONCRETE

1. Review concrete mix designs submitted by Contractor for conformance to specifications.

2. Promptly report to Owner details of reasons for rejection of any quantities of concrete. Report locations of concrete pours, quantities, date of pours and other pertinent facts concerning concrete represented by rejected specimens.

3.02 TESTING CONCRETE

1. Test Cylinders: During progress of Work, mold, cure and test specimens of each concrete curb mix design placed in any one day; make 3 compression test cylinders during pour. Mold and cure test cylinders in accordance with ASTM C 31. Test cylinders in accordance with ASTM C 39; one at 7 days and one at 28 days. Hold remaining cylinder for additional testing. Make additional sets of 3 cylinders when obvious changes in mix are apparent.

2. Slump Tests:

   a. Make slump tests for each load of concrete placed, and for each set of cylinders in accordance with ASTM C 143.
   b. Slump shall conform to limits specified.

3. Strength:

a. Seven day compressive strength of concrete shall be a minimum of 65 percent of required 28 day compressive strength.
b. Strength level of concrete will be considered satisfactory if 90 percent of strength test results and averages of all sets of 3 consecutive strength test results equal or exceed specified strength and no individual test result is below specified strength by more than 500 psi.
c. When strength of test cylinders falls below design strength and Owner has required drilling concrete core specimens, test core specimens in accordance with ASTM C 42.

3.03 SUB-GRADE DENSITY TEST

1. Perform in-place density test of completed sub-grade beneath paving in accordance with ASTM D 698 as specified in Section 02200 - Backfilling.

3.04 BASE COURSE DENSITY TEST

2. Perform in-place density test of complete base course beneath paving in accordance with ASTM D 1557 as specified in Section 02400 - Asphaltic Concrete Pavement.

END OF SECTION

SECTION 01500

CONSTRUCTION FACILITIES AND TEMPORARY CONTROLS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Temporary Controls: Barriers, enclosures, and fencing, protection of the Work, and water control.

B. Construction Facilities: Parking, progress cleaning, and project signage.

1.2 RELATED SECTIONS

A. Section 02625 - Sewer Force Main Systems.

B. Section 02500 - Storm Drainage Systems.

1.3 BARRIERS

A. Provide barriers to prevent unauthorized entry to construction areas and to protect existing facilities and adjacent properties from damage from construction operations.

B. Provide barricades and walkways required by governing authorities for public right-of-ways.

C. Provide suitable barriers and such warning lights as will effectively prevent the occurrence of any accident to health, limb, or property.

D. Lights shall be maintained between the hours of sunset and sunrise.

E. Provide protection for plant life designated to remain. Replace damaged plant life.

F. Protect non-owned vehicular traffic, stored materials, site and structures from damage.

1.4 FENCING

A. Construction: Contractor's option.

B. Laydown and Staging: Required.

1.5 WATER CONTROL

A. Grade site to drain. Maintain excavations free of water. Provide, operate, and maintain pumping equipment.

B. Protect site from puddling or running water. Provide water barriers as required to protect site from soil erosion.

1.6 PROTECTION OF INSTALLED WORK

A. Protect installed work and provide special protection where specified in individual specification sections.

B. Provide temporary and removable protection for installed Products. Control activity in immediate work area to minimize damage.

1.7 SECURITY

A. Provide security and facilities to protect Work, and existing facilities, and Owner's operations from unauthorized entry, vandalism, or theft.

1.8 PROGRESS CLEANING

A. Maintain areas free of waste materials, debris, and rubbish. Maintain site in a clean and orderly condition.

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

Not Used

END OF SECTION

SECTION 01510

TEMPORARY UTILITIES

PART 1 – GENERAL

1.01 DESCRIPTION: Design, furnish and install temporary utilities at locations required for and in support of the timely performance of the Work. Maintain, expand and/or modify temporary utilities as needed throughout the progress of the Work. Do not remove temporary utilities until services are no longer needed, or are replaced by the authorized use of completed permanent facilities. All costs associated with temporary utilities shall be the responsibility of the Contractor.

1.02 RELATED REQUIREMENTS SPECIFIED ELSEWHERE:

A. Section 02625 – Sewer Force Main Systems

1.03 REQUIREMENTS OF REGULATORY AGENCIES: Comply with Federal, State and local codes and regulations, and with private and municipal utility companies/agencies requirements. Pay all agency fees and costs associated with connection, installation, maintenance, use and removal of temporary utilities.

1.04 CONDITIONS OF USE: Operate temporary utilities in a safe and efficient manner. Do note overload temporary utilities. Do not allow unsanitary conditions, public nuisances or hazardous conditions to develop or persist on site. Remove temporary utilities as soon as their use is no longer required.

1.05 MATERIALS: Materials may be new or used, shall be adequate in capacity for the required usage, shall not create unsafe conditions, and shall be in compliance with the requirements of applicable codes and standards.

1.06 TEMPORARY POWER AND LIGHTING:

A. Arrange with utility company to provide service required for power and lighting, and pay all costs for services and for power used.

B. Install weatherproof, ground circuit and branch wiring, with area distribution boxes located so that power and lighting are available by the use of construction-type power cords, as needed in the construction area.

C. Provide adequate artificial lighting for all areas of the Work, when natural light is not adequate to perform the Work.

D. Provide lighting as appropriate to the condition, for property security purposes, and for safety purposes wherever the public has or is likely to have night access.

1.07 TEMPORARY SANITARY FACILITIES:

A. Provide sanitary facilities and enclosures for the convenience of construction personnel, and in compliance with laws and regulations.

B. Periodically service, maintain and clean facilities and enclosures, to keep them in a clean and sanitary condition.

C. Existing plumbing facilities on site shall not be used by construction personnel.

D. Existing plumbing facilities in the surrounding areas shall not be used by construction personnel without prior written approval, including descriptions of conditions, limits and duration, of the facility owner.

1.08 TEMPORARY BYPASS PUMPING FACILITIES:

A. Provide a temporary duplex bypass pumping system of adequate size to provide for the pumping of domestic sewage around the construction area and into the existing 20" force main along Chestnut Road. The bypass pumping system shall be duplex pump system, consisting of piping, pumps, a float control system, and adequate fuel supply to operate 24 hours a day and at all times during the construction of the upgrades to the Chestnut Road pumps.

B. The bypass pumps shall have 'quiet pack' type options installed to reduce the noise of the pumps during operation. The surrounding restaurants will be in operation during the bypass pumping operations. The Contractor shall ensure that the bypass pumping operation does not negatively affect the residents of the surrounding properties.

C. The average sewage flow into the existing pump station are estimated to be up to 3,000 GPM at 60 feet of TDH.

1.09 REMOVAL:

A. Completely remove temporary materials, equipment, etc., when their use is no longer required.

B. Clean and repair impacts and damage caused by temporary installations or use of temporary facilities.

C. Restore existing facilities used for temporary services to specified or original condition.

D. Restore permanent facilities used for temporary services to specified condition.

END OF SECTION

SECTION 01550

TRAFFIC REGULATION

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Flagmen.

B. Flares and lights.

C. Traffic signs and signals.

D. Removal.

1.2 RELATED SECTIONS

A. Section 01500 - Construction Facilities and Temporary Controls.

1.3 REFERENCES

A. FHA Manual on Uniform Traffic Control Devices for Streets and Highways, 2000 Edition, and all subsequent addenda.

B. 2000 SCDOT Work Zone Safety Handbook, March 1995 Edition, and all subsequent addenda.

PART 2 PRODUCTS

2.1 SIGNS, SIGNALS, AND DEVICES

A. Post Mounted and Wall Mounted Traffic Control and Informational Signs.

B. Automatic Traffic Control Signals: As approved by local jurisdictions.

C. Traffic Cones and Drums, Flares and Lights: As approved by local jurisdictions.

D. Flagmen Equipment: As approved by local jurisdictions.

2.2 FLAGMEN

A. Provide trained and equipped flagmen to regulate traffic when construction operations or traffic encroach on public traffic lanes.

2.3 FLARES AND LIGHTS

A. Use flares and lights during hours of low visibility to delineate traffic lanes and to guide traffic.

2.4 TRAFFIC SIGNS AND SIGNALS

A. At approaches to site and on site, install at crossroads, detours, parking areas, and elsewhere as needed to direct construction and affected public traffic.

B. Install and operate automatic traffic control signals to direct and maintain orderly flow of traffic in areas under Contractor's control, and areas affected by Contractor's operations.

C. Relocate as work progresses, to maintain effective traffic control.

D. Maintain signs and signals at all times.

PART 3 EXECUTION

3.1 REMOVAL

A. Remove equipment and devices when no longer required.

B. Repair damage caused by installation.

C. Remove post settings to a depth of 2 feet.

END OF SECTION

SECTION 01630

PRODUCTS & MATERIALS

PART 1 GENERAL

1.1 DESCRIPTION:

A. Materials, products and equipment incorporated into the Work shall conform to applicable specifications and standards and shall comply with size, make, type and quality specified, unless specifically approved in writing by the Engineer.

B. For Manufactured and Fabricated Products:

1. Products: Means new material, machinery, components, equipment, fixtures, and systems forming the Work. Does not include machinery and equipment used for preparation, fabrication, conveying and erection of the Work. Products may also include existing materials or components required for reuse.

2. Do not use materials and equipment removed from existing premises, except as specifically permitted by the Contract Documents.

3. Provide interchangeable components of the same manufacturer, for similar components.

4. Design, fabricate and assemble in accordance with Industry Standards.

5. Manufacture like parts of duplicate units to standard sizes and gauges, to be interchangeable.

6. Similar types of equipment shall be products of the same manufacturer.

7. Products shall be suitable for service conditions.

8. Equipment capacities, sizes and dimensions indicated or specified shall be adhered to unless variations are specifically approved in writing.

C. Do not use material or equipment for any purpose other than that for which it is intended.

1.2 REFERENCED STANDARDS:

A. When Contract Documents require compliance with Industry Standards, these Standards shall have the same force and effect as if bound into or copied directly into the Contract Documents.

B. Where compliance with an Industry Standard is specified, comply with latest edition of the Standard available at the time of bidding, except as otherwise indicated.

C. Where compliance with two (2) or more Standards is specified and these Standards establish conflicting requirements, most restrictive shall apply. Where conflicts occur,

notify Engineer for concurrence prior to proceeding with work.

D. Where Industry Standards are required for proper performance of the Work, make copies of that referenced Standard available for review at the job site.

1.3 MANUFACTURER'S INSTRUCTIONS:

A. When Contract Documents require that installation of products shall comply with manufacturer's printed instructions, obtain and distribute copies of such instructions to parties involved in the installation. Maintain one set of complete instructions at the job site.

B. Perform Work in strict accordance with manufacturer's instructions. Do not omit any preparatory step or installation procedure unless specifically modified or exempted by Contract Documents.

C. Handle, install, connect, clean, condition, and adjust products in strict accordance with manufacturer's instructions and in conformance with specified requirements. Should job conditions or specified requirements conflict with manufacturer's instructions, or in any way affect warranty, consult with Engineer for clarification. Do not proceed with Work without clear instructions.

1.4 TRANSPORTATION AND HANDLING:

A. Transport and handle Products in accordance with manufacturer's instructions.

B. Arrange deliveries of products in accordance with construction schedules. Coordinate to avoid conflict with Work and conditions at the site.

C. Deliver products in undamaged condition, in manufacturer's original containers or packaging, with identifying labels intact and legible. Label packaging with names, model numbers, types, grades, compliance with standards, information required by law or regulation, and similar information needed for distinct identification.

D. Immediately on delivery, inspect shipments to assure compliance with requirements of Contract Documents and approved submittals, that Products are properly protected and undamaged, and that quantities are correct.

E. Provide adequate equipment and personnel to properly handle products. Handle products carefully to avoid soiling, damage, breakage, disfigurement and marring of finishes. Damaged materials will not be accepted.

1.5 STORAGE AND PROTECTION:

A. Store materials at the site, unless off-site storage is required by the Contract Documents, or is requested in writing by the Contractor and authorized by the Engineer. Store and protect products in accordance with manufacturer's instructions. Store sensitive Products in weather-tight, climate controlled enclosures. See specification Sections for special requirements.

B. Exterior Storage:

1. Store products above the ground on sloped supports, blocking or skids to prevent water ponding, soiling or staining. Cover products which are subject to deterioration with impervious sheet coverings, provide adequate ventilation to avoid condensation.

2. Store loose granular materials in a well-drained area on solid surfaces to prevent mixing with foreign matter.

C. Arrange storage in a manner to provide easy access for inspection with seals and labels in tact and legible. Make periodic inspections of stored products to assure that they are maintained under specified conditions, and free from damage or deterioration.

D. Provide substantial coverings as necessary to protect installed products from deterioration or damage. Provide ventilation to avoid condensation. Remove protection when no longer needed.

E. Secure all stored materials, and protect from theft, vandalism, and sabotage.

F. Provide off-site storage and protection when site does not permit on-site storage or protection.

G. Store loose granular materials on solid flat surfaces in a well-drained area. Prevent mixing with foreign matter.

H. Arrange storage of Products to permit access for inspection. Periodically inspect to assure Products are undamaged and are maintained under specified conditions.

1.6 PRODUCT OPTIONS AND SUBSTITUTIONS:

A. The Contract is based on the products, materials, and equipment indicated in the Contract Documents.

B. Product Options:

1. Products specified by reference standards or by description only: Any product meeting those standards or description.

2. Products specified by naming one or more manufacturers: Products of manufacturers named and meeting specifications, no options allowed.

3. Products specified by naming one or more manufacturers with a provision for "approved equal": Submit a request for substitution for any manufacturer not named.

C. No increase in contract amount will be allowed for a product substitution rejected as not an approved equal. If in doubt, submit product for approval prior to submitting bid.

D. The Contractor's requests for changes in the products, materials, equipment and methods of construction required by the Contract Documents are considered requests for "substitutions", and are subject to the requirements of Section 01631 – Substitutions.

PART 2 – PRODUCTS (Not Applicable)

PART 3 – EXECUTION (Not Applicable)

END OF SECTION

SECTION 01631

SUBSTITUTIONS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes administrative and procedural requirements for handling requests for substitutions prior to receipt of bids, and for requests for substitutions made after award of the Contract.

1.3 DEFNITIONS

A. Definitions in this Article do not change or modify the meaning of other terms used in the Contract Documents.

B. Substitutions: Changes to products, materials, equipment, and/or methods of construction required by the Contract Documents, proposed by the Contractor either before or after award of the Contract, are considered to be requests for substitutions. The following are not considered to be requests for substitutions:

1. Revisions to the Contract Documents directed by the Owner or Engineer.

2. Specified options of products and construction methods included in the Contract Documents.

3. The Contractor's determination of and compliance with governing regulations and orders issued by governing authorities.

1.4 CONDITIONS FOR SUBSTITUTION

A. Conditions: The Engineer will receive and consider (solely at the Engineer's discretion) the Contractor's request for substitution when one or more of the following conditions are satisfied:

1. Extensive revisions to the Contract Documents are not required due to the substitution.

2. Proposed changes are in substantial compliance with the Contract Documents.

3. The request is timely, fully documented, and properly submitted.

4. The specified product or method of construction becomes unavailable or cannot be provided within the contract time. The Engineer will not consider the request if the

product or method cannot be provided as a result of the Contractor's failure to pursue the work promptly, or to coordinate activities properly.

5. The request is directly related to an "or equivalent" clause or similar language in the Contract Documents.

6. The requested substitution offers the Owner a substantial advantage, in cost, time, energy conservation, or other considerations, after deducting additional responsibilities the Owner must assume. The Owner's additional responsibilities may include, but are not limited to, compensation to the Engineer for redesign and evaluation services, increased cost of other construction by the Owner, and similar considerations.

7. When not a result of the Contractor's failure to pursue the work promptly, or to coordinate activities properly, the specified product or method of construction cannot receive necessary or timely approval by a governing authority, and the requested substitution can be approved in a timely manner.

8. The specified product or method of construction cannot be provided in a manner that is compatible with other materials, and where the Contractor certifies that the substitution will overcome the incompatibility.

9. The specified product or method of construction cannot be coordinated with other materials, and where the Contractor certifies that the proposed substitution can be coordinated.

10. The specified product or method of construction cannot provide the warranty required by the Contract Documents, and where the Contractor certifies that the proposed substitution provides the required warranty.

11. The specified product or method is noted with an "approved equal" clause.

B. The burden of proof of the merit of the proposed substitution rests solely upon the Contractor.

C. A request for substitution constitutes a representation that the Contractor:

1. Has investigated the proposed product (whether proposed by him or through him by a subcontractor or material supplier) and determined that it is in every respect equal to, or superior to the quality and performance level of specified product;

2. Shall provide at least the same warranties or bonds for the substitution as for the product specified;

3. Shall coordinate the installation of the substitution into the Work, and shall make and include in any pricing, such other changes as may be required to make the Work complete in all respects;

4. And, shall waive all claims for any increase in the Project cost or time extension which may subsequently become apparent due to the inclusion of the substitution.

D. Substitutions will not be considered when they are indicated or implied on Shop Drawing or Product Data submittals, without separate written request, or when acceptance will require revision to the Contract Documents.

E. The Engineer will only conduct substitution reviews under the premises that the Contractor's Shop Drawing, Product Data, Sample, etc. submissions are in full compliance with meaning and intent of the Contract Documents, and that the implementation of the substitution will have no negative scheduling, sequencing and/or cost effect on any other Project Work. Should it be determined, after the Engineer's approval of a substitution, that the submission was in fact not in compliance with the Contract Documents, or that the submission does/will have any negative effect on other Project Work, the Engineer's approval shall immediately become null and void, and the Contractor shall be solely responsible for providing the original Work in strict accordance with the Contract Documents, at no additional cost to the Owner. Delays to the Project, resulting from such determinations, shall be solely the responsibility of the Contractor, who shall bear any and all scheduling, sequencing and/or financial consequences of such delays.

F. The Engineer will be the only judge of the acceptability of the proposed substitution; the decisions of the Engineer are final.

1.5 TIMING OF SUBMITTAL OF SUBSTITUTION REQUESTS

A. Substitution Requests prior to receipt of bids: The Engineer will consider requests for substitution if received at least ten (10) calendar days prior to date and time of bid opening. Requests received less than the ten (10) calendar days prior to date and time of bed opening will not be considered.

B. Substitution Requests after Award of Contract: The Engineer will consider requests for substitution received within thirty (30) days after Award of Contract (but not between bid date and award date, unless specifically requested by the Engineer). Contractor shall provide the Engineer with a minimum of fourteen (14) calendar days from receipt of request, to conduct an initial review of the request; where multiple requests are submitted in any given week, Engineer will require as much time as necessary in excess of fourteen (14) days to conduct all initial reviews. Contractor is solely responsible for timely submission requests, so as to avoid any delay in the normal sequence of implementation of all other aspects of the Work.

1.6 SUBMITTAL REQUIREMENTS

A. Submit three (3) copies of each request for substitution for consideration. Limit each request to one proposed substitution. Submit requests in the form and according to procedures required for Change Order Proposals.

B. Identify the product or the fabrication or installation method to be replaced in each request. Include related Specification Section and Drawing numbers.

C. Provide complete documentation showing compliance with the requirements for substitutions, and the following information, as appropriate:

1. Coordination information, including a list of all changes or modifications needed to

other parts of the Work, and to construction performed by the Owner and separate contractors, that will be necessary to accommodate the proposed substitution.

2. A detailed comparison of all significant qualities of the proposed substitution with those of the Work specified. Significant qualities shall include performance, weight, size, durability, visual effect, etc.

3. Product data, including drawings, specification sheets and descriptions of products, and fabrication and installation procedures.

4. Samples, where applicable or requested.

5. A statement indicating the substitution's effect on the Contractor's Construction Schedule, compared to the schedule without approval of the substitution. Confirm that the proposed substitution will not increase overall contract time.

6. Cost information, including a proposal of the net change, if any, in the contract sum.

7. The Contractor's certification that the proposed substitution conforms to requirements in the Contract Documents in every respect and is appropriate for the applications indicated.

8. Where substitution differs in any respect from that specified, provide documentation of how, where and to what degree substitution differs.

9. The Contractor's waiver of rights to additional payment or time that may subsequently become necessary because of the failure of the substitution to perform adequately.

10. Confirmation of approval, by all appropriate governing authorities, for the proposed substitution.

1.7 ENGINEER'S ACTION

A. General:

1. If necessary in order to judge the appropriateness of a proposed substitution, the Engineer may request additional information or documentation be supplied by the Contractor. The Engineer may reject any submission request, due to the Contractor's negligence or omission in submitting all data required for the Engineer to determine an equivalency evaluation for a substitution. Contractor is solely responsible for timely re-submissions, so as to avoid any delay in the normal sequence of implementation of all aspects of the Work.

2. The Engineer is under no obligation to the Contractor to take any action on a Substitution Request. Should the Engineer take no action on a substitution request, Contractor shall provide the product, system, or assembly exactly as specified. If the Engineer takes no action on a submission request, lack of action shall be taken as a rejection of the request.

B. Actions prior to Bid Date:

1. Actions on requests prior to Bid Date: should the Engineer elect to modify the Contract Documents to include the requested substitution, the Engineer will do so with the issuance of an Addendum (no direct approval notification will be provided to the submitting Contractor). Should the Engineer elect to reject a submission request, he may attempt to notify the submitting Contractor of the decision to reject. However, notification to the Contractor is not required; if the substitution is not addressed in an Addendum, the Contractor shall understand that such an omission constitutes rejection of the submission request.

C. Actions after Award of Contract:

1. Actions on requests after Award of Contract: should the Engineer elect to modify the Contract Documents to include the requested substitution, the Engineer will (if no change in cost is involved) do so by direct approval notification to the Contractor. If there is a change in Contract Amount associated with the request, the Engineer will issue a Change Order, if request is to be included in the Project. Should the Engineer elect to reject a submission request, he will, except in extraordinary circumstances, attempt to notify the submitting Contractor of the decision to reject. However, if the Engineer does not act upon a specific submission request within thirty (30) calendar days of receipt, Contractor shall understand that the request has been rejected.

PART 2 – PRODUCTS (Not Applicable)

PART 3 – EXECUTION (Not Applicable)

END OF SECTION

SECTION 01700

CONTRACT CLOSEOUT

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Closeout Procedures.

B. Final Cleaning.

C. Adjusting.

D. Project Record Documents.

E. Spare Parts and Maintenance Materials.

1.2 RELATED SECTIONS

A. Section 01050 - Applications for Payment Procedures.

B. Section 01060 - Change Order Procedures.

C. Section 01300 - Submittals.

1.3 CLOSEOUT PROCEDURES

A. Submit written certification that Contract Documents have been reviewed, Work has been inspected and that Work is complete in accordance with Contract Documents and ready for Engineer's inspection.

B. Submit Final Application for Payment identifying total adjusted Contract Sum, previous payments and sum remaining due.

C. Submit Final Closeout paperwork to the Owner, including the following:

1. AIA Form G706 – Contractor's Affidavit of Payment of Debts and Claims
2. AIA Form G706A – Contractor's Affidavit of Release of Liens
3. AIA Form G707 – Consent of Surety to Final Payment

1.4 FINAL CLEANING

A. Execute final cleaning prior to final inspection.

B. Clean site; sweep paved areas, rake clean landscaped areas.

C. Remove waste and surplus materials, rubbish, and construction facilities from the site.

1.5 ADJUSTING

A. Adjust operating Products and equipment to ensure smooth and unhindered operation.

1.6 PROJECT RECORD DOCUMENTS

A. Maintain on site, one set of the following record documents; record actual revisions to the work:

1. Contract Drawings.
2. Specifications.
3. Addenda.
4. Change orders and other modifications to the Contract.
5. Reviewed shop drawings, product data and samples.

B. Store Record Documents separate from documents used for construction.

C. Record information concurrent with construction progress.

D. Record Documents and Shop Drawings: Legibly mark each item to record actual construction including:

1. Measured depths of foundations in relation to finish elevation.
2. Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements.
3. Measured locations of internal utilities and appurtenances concealed in construction, referenced to visible and accessible feature of the Work.
4. Field changes of dimension and detail.
5. Details not on original Contract Drawings.

E. Submit documents to Engineer with claim for final Application for Payment.

1.7 SPARE PARTS AND MAINTENANCE MATERIALS

A. Provide products, spare parts, maintenance and extra materials in quantities specified in individual specification Sections.

B. Deliver to Project site and place in location as directed.

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

Not Used

END OF SECTION

SECTION 01720

PROJECT RECORD DOCUMENTS

PART 1 GENERAL

1.1 DESCRIPTION

A. Scope of Work:

1. Maintenance of Record Documents

2. Information Required for Record Documents

3. Submittal of Record Documents

1.2 MAINTENANCE OF RECORD DOCUMENTS

A. At the Pre-Construction Conference the Contractor will be provided as part of the construction package one set of Contract Documents to maintain a record of construction progress for the duration of the project. These documents will be labeled "PROJECT RECORD" and will be kept on site throughout the construction process.

B. The Contractor will maintain at the job site, one record copy of:

1. Reviewed Shop Drawings.
2. Review Samples.
3. Change Orders.
4. Other Modifications to Contract.
5. Field Test Records.
6. Inspection Certificates.
7. Manufacturer's Certificates.

C. Store record documents and samples in the Contractor's field office apart from documents used for construction. Provide files, racks, and secure storage for record documents and samples.

D. Label and file record documents and samples in accordance with Specification Section number listing in Table of Contents of this Project Manual. Label each document "PROJECT RECORD" in neat, large, printed letters.

E. Maintain record documents in clean, dry and legible condition. Do not use record documents for construction purposes.

F. Record documents will be reviewed monthly by the Engineer as part of the monthly project progress review associated with review and recommendation of partial payment requests. Payment requests will be denied if the Contractor does not maintain adequate record document.

1.3 RECORDING

A. Record and update daily "as-built" information from field notes, on Drawings and in Specifications provided at the Pre-Construction Conference in accordance with the requirements provided herein.

B. Provide felt tip marking pens, maintaining separate colors for each major system, for recording information.

C. Record information concurrently (daily) with construction progress. Do not conceal work until required information is recorded.

1.4 INFORMATION TO BE DOCUMENTED

A. Contract Drawings and Shop Drawings: Legibly mark each item to record actual construction, including:

1. General Information

a. Contractor's Name, Address, Telephone Number, Contact Person
b. Measured horizontal and vertical locations of underground utilities and appurtenances (electric, cable, telephone, gas,), referenced to permanent surface improvements. Include vertical and horizontal separation distances, depth of cover and pipe materials.
c. Field changes of dimension and detail.
d. Changes made by Change Order or Field Order.
e. Details not on original Drawings.
f. References to related shop drawings and Modifications.

2. Sewer Utilities

a. Manhole rim and invert elevations at mean sea level (MSL). Indicate distance of line segment from center of manhole to center of manhole, pipe size, material, and grade.
b. Tie-down locations of manholes to permanent structures (fire hydrants, buildings, property corners,). A minimum of two (2) tie-down dimensions are required.
c. Manhole stationing from the downstream manhole going upstream, with all manholes reverting to "0+00" for the next line tangent.
d. Detail dimensions of services. Indicate distance from building, adjacent property corners, and main line. Delineate service location based on sewer station.
e. Bearings and distances for all sewer lines installed. All manholes shall be tied to State Plane Coordinates (1983 Datum). The Contractor shall, as part of his contract employ the services of a Registered Land Surveyor to provide this documentation.
f. The roadway shall be surveyed, with cross-section elevations every 50', to determine if the road was properly graded, the proper crown was installed, and that the road has the proper drainage characteristics as called for on the plans.

3. Water Utilities

   a. Tie-down locations of all water appurtenances (valves, fittings, fire hydrants,) to permanent structures (manholes, buildings, property corners,). Fire hydrants may be used as a tie-down structure for other water appurtenances. A minimum of two (2) tie-down dimensions are required. Where appurtenances (valves, fittings,) are clustered together, indicate distances between said appurtenances. Provide depth of cover for each appurtenance (valves, fittings,).
   b. Detail dimensions of fire hydrant assemblies. Indicate distance from hydrant to gate valve, distance from gate valve to hydrant tee. Include depth of burial for hydrant.
   c. Detail dimensions of water services/meters. Indicate distance from building and adjacent property corners. If sewer is installed as part of project, delineate service/meter location based on sewer stationing. If service/meter extends beyond the last manhole, extend the bearing of the final line segment to continue stationing.
   d. Waterline materials used and locations of changes in materials.
   e. Bearings and distances of total water system installed. All water appurtenances (valves, hydrants, fittings, meters,) shall be tied to State Plane Coordinates (1983 Datum). The Contractor shall, as part of his contract employ the services of a Registered Land Surveyor to provide this documentation.

4. Stormwater Utilities

   a. Catch basin and junction box rim and invert elevations at mean sea level (MSL). Indicate distance of line segment from center of basin/box to center of basin/box, pipe size, material, and grade.
   b. Tie-down locations of basins/boxes to permanent structures (fire hydrants, manholes, buildings, property corners,). A minimum of two (2) tie-down dimensions are required.
   c. Basin/box stationing from the downstream basin/box going upstream, with all basin/boxes reverting to "0+00" for the next line tangent.
   d. Bearings and distances for all storm sewer lines installed. All basins/boxes shall be tied to State Plane Coordinates (1983 Datum). The Contractor shall, as part of his contract employ the services of a Registered Land Surveyor to provide this documentation.

5. Utility Conduits and Vaults

   a. At the completion of Phase One of the project, the Contractor shall have a survey of all the installed equipment performed and submitted to the Engineer for use in preparing a final record drawing of the project. This survey shall include all pedestal and equipment locations, all four corners of all vaults and enclosures, centerlines of all utility trenches and bores, service stub-up locations next to buildings and equipment, and any other information encountered or altered from the plans during the construction of the project. This survey shall be provided to the Engineer in digital format (AutoCAD drawing, or raw point data with clear descriptions) for their use.

6. Other items as required in the Contract Documents.

B. Specifications and Addenda: Legibly mark up each Section to record:

1. Manufacturer, trade name, catalog number and supplier of each product.
2. Changes made by Change Order or Field Order.
3. Other matters not originally specified.

1.5 SUBMITTALS

A. At Contract closeout, transmit Record Documents and Samples with cover letter in duplicate, listing:

1. Date.
2. Project title and number.
3. Contractor's name, address, and telephone number.
4. Number and title of each Record Document.
5. Certification that each document as submitted is complete and accurate.
6. Signature of Contractor or authorized representative.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

SECTION 01800

REMEDIATION IN CONTAMINATED AREAS

PART 1 GENERAL

1.1 SCOPE OF WORK

1. If contaminated groundwater is encountered, work should be halted and the contractor shall notify the Owner, the Engineer, and SCDHEC immediately to allow evaluation of conditions by the Engineer, or his agent, and SCDHEC. No groundwater should be pumped, bailed, or otherwise discharged from the excavation. Any equipment or materials which come in contact with groundwater should not be removed from the immediate work area until potential levels of contamination have been assessed.

2. The proposed line being laid should be immediately sealed to prevent potentially contaminated water from flowing into the pipe. All workers should leave the excavation. Any equipment or other articles which have come into contact with the groundwater should be flushed with fresh water.

3. Samples of the groundwater will be collected by the engineer or his agent for testing. The constituent to be determined in the testing regime will be based upon the location with respect to the currently identified SWMUs (Solid Waste Management Units). Testing could include but is not limited to hydrocarbons, solvents, heavy metals, herbicides and pesticides. A work stoppage of 3 days should be anticipated for each such event.

4. If no contaminants are found, work can proceed. The volume of groundwater pumped from the excavation should be minimized. The engineer or his agent will sample periodically to determine if contamination is being transported from the SWMUs to the excavation via groundwater movement.

5. If the contamination is detected in the groundwater, any water removed from the excavation must be properly collected and stored for treatment. This collection will be undertaken by a qualified environmental contractor retained and paid for by the owner.

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

Not Used

END OF SECTION

DIVISION 2

SECTION 02100

EXCAVATION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Grading and excavation for roadway and drives.

B. Grading and excavation for pipelines and channels.

C. All excavation, formation of embankments and finishing and dressing of graded earth areas, shoulders and ditches.

1.02 RELATED SECTIONS

A. Section 01400 - Quality Control.

B. Section 02200 - Backfilling.

C. Section 02300 - Trenching.

D. Section 02400 - Asphaltic Concrete Paving.

E. Section 02420 - Concrete Curb and Gutter and Sidewalk.

1.03 FIELD MEASUREMENT

A. Verify that shot survey bench mark and intended elevations for the work are as indicated.

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

3.01 GENERAL

A. The term "excavation" used hereinafter is defined as "unclassified excavation". Excavation of every description regardless of material encountered within the grading limits of the project, shall be performed to the lines and grades indicated. Satisfactory excavated material shall be transported to and placed in the fill areas within the limits of the work. When directed by the Engineer, unsatisfactory material encountered within the limits of the work shall be excavated below the grade shown and replaced with satisfactory material as directed in order to obtain the required surface condition and density to sustain the subsequent work. Such material ordered as a replacement shall be paid for at the unit prices given in the stated allowance shown in the proposal. Surplus excavated material not required for fill shall remain the property of the Owner and shall be stockpiled in an area on the property designated by the Owner. Excavated material

which is not suitable for use as fill, shall be disposed of by the Contractor off of the Owner's property as part of the contract price. During construction, excavation and filling shall be performed in a manner and sequence that will provide drainage at all times. Except where otherwise shown on the plans or as directed, the unsatisfactory soils shall be removed to a depth required and filled with selected sands and sand clays from borrow excavations that will provide a firm, unyielding subgrade at the specified density. See Section 02200 - Backfilling, for additional details.

B. All areas covered by the project, including excavated and filled sections and adjacent transition areas, shall be uniformly smooth-graded. The finished surface shall be reasonably smooth, compacted and free from irregular surface changes. The degree of finish shall be that ordinarily obtainable from either bladegrader or scraper operations. The finished surface shall be not more than 0.10 foot above or below the established grade or approved cross section. Gutters and ditches shall be finished so as to permit adequate drainage.

C. All vegetation, roots, brush, sod, broken pavements, rubbish and other unsatisfactory or surplus material stripped or removed from the limits of construction shall be hauled off the Owner's property and disposed of by the Contractor as part of the contract price.

D. The Contractor shall be responsible for control of erosion and sedimentation during the work. Silt screens, hay bales or other devices as required shall be installed to prevent off-site migration of eroded materials. Similar devices shall be placed around storm drain catch basins and inlets to prevent the infiltration of soil materials into the underground drainage system. Such devices shall be maintained until all site work is complete. Refer to the Sediment & Erosion Control Plan in the construction drawings.

3.02 CONSERVATION OF TOPSOIL

A. Areas designated for grading operations that contain a blanket of soil which is more satisfactory for the growth of grass than the embankment material to be placed, as determined by the Engineer, shall be stripped to a depth of approximately four to six inches and placed in convenient stockpiles as directed in the field, for later use as a topsoil blanket on the new graded areas specified herein, or as designated.

B. Stockpiled material shall be placed in a satisfactory manner to afford drainage.

C. When grading operations permit, instead of stockpiling, the topsoil shall be hauled and spread directly on the areas to receive topsoil.

D. Surplus topsoil shall remain the property of the Owner.

E. This work shall be the responsibility of the Contractor and considered subsidiary to the contract work.

3.03 PROTECTION OF EXISTING SERVICE LINES, UTILITIES AND STRUCTURES.

A. Existing utility lines and structures that are shown on the drawings or the locations or other utility lines which may exist in the project area, as well as utility lines constructed during excavation operations, shall be protected from damage during excavation, and if damaged, shall be repaired by the Contractor at his expense.

B. When utility lines that are to be removed or relocated are encountered within the area of operations, the Contractor shall notify the utility company in ample time for the necessary measures to be taken to prevent interruption of the service.

C. It shall be the Contractor's responsibility to contact all utility companies with services in the area for an accurate location of the respective utilities prior to beginning excavation.

3.04 EXCAVATION OF DITCHES

A. Ditches shall be cut accurately to the cross sections and grades indicated by the drawings.

B. All roots, stumps and other foreign matter in the sides and bottom of ditches shall be cut 18 inches below the grades indicated.

C. Any excessive ditch excavation due to the removal of roots, stumps, or due to over-excavation, shall be backfilled to grade either with satisfactory soils thoroughly compacted, or with suitable stone or cobble to form an adequate ditch paving, as directed, at no additional cost to the Owner.

D. The Contractor shall maintain all ditches excavated under this specification free from detrimental quantities of leaves, sticks and other debris until final acceptance of the work.

E. Satisfactory earth material excavated from ditches and channel changes shall be placed in fill areas as directed.

F. All excess excavation and debris shall be disposed of off-site unless otherwise directed the Engineer.

G. No diking or berming of soils along the bank will be permitted.

H. No excavated material shall be deposited within a distance of three feet from the edge of any ditches.

I. When storm drain pipe terminates in a new ditch, ditch pavement, if specified, shall be constructed immediately as called for on the drawings.

J. The Contractor shall be responsible for maintaining these newly constructed ditches and take immediate action to keep erosion of the ditch bottom and slopes to a minimum during the life of the contract. No additional compensation will be given to the Contractor for the required maintenance.

3.05 PREPARATION

A. Identify required lines, levels, contours and datum.

B. Identify known underground, above ground and aerial utilities. Stake and flag locations.

C. Protect above and below grade utilities which are to remain.

D. Protect plant life, lawns and other features remaining as a portion of final landscaping.

E. Protect bench marks, existing structures, fences, sidewalks, paving and curbs from excavation equipment and vehicular traffic.

3.06 EXCAVATION

A. Underpin adjacent structures which may be damaged by excavation work, including utilities and pipe chases.

B. Excavate subsoil required to accommodate building foundations, slabs-on-grade, paving and site structures.

C. Grade top perimeter of excavation to prevent surface water from draining into excavation.

D. Hand trim excavation. Remove loose matter.

E. Remove lumped subsoil, boulders and rock up to 1/3 cubic yard measured by volume.

F. Notify Engineer of unexpected subsurface conditions and discontinue affected work in area until notified to resume work.

G. Correct unauthorized excavation at no extra cost to Owner.

H. Stockpile excess excavated material not being used in area designated on Owner's property.

3.07 FIELD QUALITY CONTROL

A. Field Inspection will be performed under provisions of Section 01400.

B. Provide for visual inspection of bearing surfaces.

3.08 PROTECTION

A. Protect excavations by methods required to prevent cave-in or loose soil from falling into excavation.

END OF SECTION

SECTION 02200

BACKFILLING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Building perimeter and site structure backfilling to subgrade elevations.

B. Site filling and backfilling.

C. Fill and compaction of trenches.

D. Fill under asphaltic paving.

E. Consolidation and compaction.

F. Fill for over-excavation.

1.02 RELATED SECTIONS

A. Section 02100 - Excavation.

B. Section 02300 - Trenching.

1.03 REFERENCES

A. ASTM C 136 - Sieve Analysis of Fine and Coarse Aggregates.

B. ASTM D 1556 - Standard Test Method for Density of Soil in Place by the Sand-Cone Method.

C. ASTM D 1557 - Standard Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures using a 10-lb Rammer and 18-in. Drop.

D. ASTM D 2922 - Standard Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods.

PART 2 PRODUCTS

2.01 FILL MATERIALS

A. Type A (Class 1) - Coarse Stone Crushed: Angular, washed natural stone; free of shale, clay, friable material, sand, debris; graded in accordance with ASTM C 136 within the following limits:

Sieve Size	Percent Passing
2 inches	100
1 inch	95
3/4 inch	95 to 100
5/8 inch	75 to 100
3/8 inch	55 to 85
No. 4	35 to 60
No. 16	15 to 35
No. 40	10 to 25
No. 200	5 to 10

B. Type B (Class 2) - Pea Gravel: Natural stone; washed, free of clay, shale, organic matter; graded in accordance with ASTM C 136, to the following:

1. Minimum Size: 1/4 inch
2. Maximum Size: 5/8 inch

C. Type C (Class 3) - Sand: Natural river or bank sand; washed, free of silt, clay, loam, friable or soluble materials or organic matter; graded in accordance with ASTM C 136, within the following limits:

Sieve Size	Percent Passing
No. 4	100
No. 14	10 to 100
No. 50	5 to 90
No. 100	4 to 30
No. 200	0

D. Subsoil: Reused and/or imported, free of gravel larger than 3-inch size, roots and other organic material and trash and approved by the Engineer.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify from Engineer fill materials to be reused are acceptable.

3.02 PREPARATION

A. Generally, compact subgrade to density requirements for subsequent backfill materials.

B. Cut out soft areas of subgrade not capable of insitu compaction. Backfill with Type C fill and compact to density equal to or greater than requirements for subsequent backfill material.

C. Prior to placement of aggregate base coarse material at gravel or paved areas, compact subgrade to a minimum of 98% of its maximum dry density in accordance with ASTM D 1557 and AASHTO T-180.

D. All vegetation, such as roots, brush, heavy sods, heavy growth of grass and all decayed vegetable matter, rubbish and other unsuitable material within the area upon which fill is to be placed shall be stripped or otherwise removed before the fill is started.

E. In no case will unstable material remain in or under the fill area that will prevent the placement and compaction of subsequent layers to the specified densities.

F. Sloped ground surfaces steeper than one vertical to four horizontal on which fill is to be placed shall be plowed, stepped and benched, or broken up as directed, in such manner that the fill material will bond with the existing surface.

G. Prepared surfaces on which compacted fill is to be placed shall be scarified, wetted or dried as may be required to obtain the compaction specified.

3.03 BACKFILLING

A. Backfill areas at the locations and to lines and elevations shown on the drawings.

B. Filled areas shall conform to the shape of the typical sections indicated or shall meet the requirements of the particular case.

C. Systematically backfill to allow maximum time for natural settlement. Do not backfill over porous, wet, frozen or spongy subgrade surfaces.

D. Granular Fill: Place and compact materials in continuous layers not exceeding 6 inches compacted depth.

E. Soil Fill: Place and compact material in continuous layers not exceeding 8 inches compacted depth.

F. Employ a placement method that does not disturb or damage utilities in trenches.

G. Maintain optimum moisture content of backfill materials to attain required compaction density.

H. Slope grade away from buildings minimum 2 inches in 10 ft., unless noted otherwise.

I. Make grade changes gradual. Blend slope into level areas.

J. Stockpile surplus reusable backfill materials on Owner's property at Owner's designated site.

K. Leave fill material stockpile areas completely free of excess unsuitable materials.

3.04 TOLERANCES

A. Top Surface of Backfilling: Plus or minus one tenth from required elevations.

3.05 FIELD QUALITY CONTROL

A. Field inspection will be performed by the Engineer.

B. Tests and analysis of fill material will be performed in accordance with ASTM D 1557 (AASHTO T-180).

C. Compaction testing will be performed in accordance with ASTM D 1557 (AASHTO T-180) and ASTM D 2922.

D. If tests indicate work does not meet specified requirements, remove work, replace and retest at no additional cost to Owner.

E. Frequency of tests: As required by the testing firm or as directed by the Engineer.

F. Proof roll all compacted fill surfaces under paving with a loaded tandem wheel dump truck with no detectable defection.

3.06 PROTECTION OF FINISHED WORK

A. Protect all finished Work.

B. Recompact fills subjected to vehicular traffic.

3.07 COMPACTION REQUIREMENTS

A. The compaction of fill materials shall meet the following requirements as determined by the maximum density obtained at optimum moisture content by an approved laboratory.

1.	Fill under buildings	100%
2.	Fill under paved areas	98%
3.	Fill in other areas	95%

B. The Contractor shall be responsible for compaction of the existing soils to meet the above compaction requirements.

C. The Contractor will be responsible for compacting the subgrade to the required density by whatever means necessary.

3.08 SCHEDULE

A. Fill under grassed areas.

1. Subsoil fill to finished grade.

B. Fill under asphaltic concrete pavement.

1. Type C fill to 8 inches below finished paving elevation.

END OF SECTION

SECTION 02300

TRENCHING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Excavate trenches for utilities.

B. Compacted bedding under fill over utilities.

C. Backfilling and compaction.

1.02 RELATED SECTIONS

A. Section 02100 - Excavation.

B. Section 02200 - Backfilling.

1.03 FIELD MEASUREMENTS

A. Verify that survey benchmark and intended elevations for the Work are as shown on the drawings prior to proceeding with construction.

PART 2 PRODUCTS

2.01 FILL MATERIALS

A. Types A, B, and C subsoil materials as specified in Section 02200.

2.02 BED MATERIALS

A. Type 1 Material: As specified for Type A in Section 02200.

B. Type 2 Material: As specified for Type B in Section 02200.

C. Type 3 Material: As specified for Type C in Section 02200.

D. Subsoil Material: As specified in Section 02200.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify fill materials to be reused are acceptable.

3.02 PREPARATION

A. Identify required lines, levels, contours, and datum, which pass through work area.

B. Maintain and protect existing utilities remaining, which pass through work area.

C. Protect plant life, lawns, rock outcropping and other features remaining as a portion of final landscaping.

D. Protect benchmarks, existing structures, fences, sidewalks, paving and curbs from excavation equipment and vehicular traffic.

E. Protect above and below grade utilities which are to remain.

F. Cut out soft areas of subgrade not capable of insitu compaction. Backfill with Type 3 fill and compact to density equal to or greater than requirements for subsequent backfill material.

3.03 EXCAVATION

A. Excavate subsoil required for storm sewer, sanitary sewer, or water line piping.

B. Cut trenches sufficiently wide to enable installation of utilities and inspection at a minimum of 1 foot each side of pipe.

C. Hand trim excavation. Hand trim for bell and spigot pipe joints. Remove loose matter.

D. Remove lumped subsoil, boulders and rock larger than 3 inches in diameter.

E. Correct unauthorized excavation at no cost to Owner.

F. Correct areas over-excavated by error.

G. Stockpile excess excavated material, suitable for use as fill, in a designated area on the Owner's property. Excess excavated material unsuitable for use as fill shall be removed from the site and disposed of by the Contractor as part of the contract price.

3.04 BEDDING

A. Support pipe during placement and compaction of bedding fill.

3.05 BACKFILLING

A. Backfill trenches to elevations shown on plans.

B. Systematically backfill to allow maximum time for maximum compaction. Do not backfill over porous, wet, frozen or spongy subgrade surfaces.

C. Granular Fill: Place and compact material in continuous layers not exceeding 6 inches compacted depth.

D. Soil Fill: Place and compact material in continuous layers not exceeding 6 inches compacted depth.

E. Employ a placement method that does not disturb or damage foundation perimeter, pipe, or conduit in trench.

F. Maintain optimum moisture content of backfill materials to attain required compaction density.

G. Stockpile surplus reusable backfill materials on site in a location approved by Owner.

H. Leave fill material stockpile areas completely free of excess unsuitable materials.

3.06 TOLERANCES

A. Top Surface of Backfilling: Plus or minus one tenth from required elevations.

3.07 FIELD QUALITY CONTROL

A. Field inspection will be performed by the Engineer and/or Engineer-approved independent testing firm.

3.08 PROTECTION OF FINISHED WORK

A. Protect all finished Work.

B. Recompact fills subjected to vehicular traffic.

END OF SECTION

SECTION 02400

ASPHALTIC CONCRETE PAVEMENT

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Aggregate Base and Asphaltic Concrete Pavement.

B. Sampling and Testing.

1.2 RELATED SECTIONS

A. Section 01410 - Testing and Laboratory Services.

B. Section 02100 - Excavation.

C. Section 02200 - Backfilling.

D. Section 02460 - Thermoplastic Pavement Markings.

1.3 REFERENCES

A. SCDOT SS - South Carolina State Highway Department Standard Specifications, 2007 Edition.

B. The Federal Highway Administration Manual on Uniform Traffic Control Devices for Streets and Highways, 2000 Edition.

C. ASTM D 1188 - Bulk Specific Gravity and Density of Compacted Bituminous Mixtures Using Paraffin-Coated Specimens.

D. ASTM D 1556 - Density of Soil in Place by the Sand-Cone Method.

E. ASTM D 1557 - Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft).

F. ASTM D 2726 - Bulk Specific Gravity of Compacted Surface-Dry Specimens.

G. ASTM D 2922 - Density of Soil and Soil-Aggregate in Place by Nuclear Methods.

H. ASTM D 3017 - Moisture Content of Soil and Rock in Place by Nuclear Methods.

1.4 QUALITY ASSURANCE

A. Except as specified herein or as indicated, work and materials shall be in accordance with the SCDOT SS. The provisions therein for method of measurement and payment do not apply.

B. Obtain materials from same source throughout.

C. Coordinate with testing laboratory to provide testing as specified in Section 01410 - Testing Laboratory Services.

1.5 ENVIRONMENTAL REQUIREMENTS

A. Do not produce or place asphaltic concrete when the weather is rainy or foggy, when the base course is frozen or has excess moisture, or when the ambient temperature is less than 40 degrees F in the shade away from artificial heat.

1.6 SUBMITTALS

A. Job-Mix Formula: Submit the mix design, including mixing temperature, for approval. The mix design shall include a certified laboratory analysis of mix composition with marshall stability value, void content, and flow. After mix design approval, job mixes shall conform to the range of tolerances specified in SCDOT SS. Obtain acknowledgment of receipt prior to asphaltic concrete placement. Submit additional data regarding materials if the source of the materials changes.

B. Certificates

1.1 Base course

1.7 BARRICADES AND SIGNALS

A. Provide and maintain temporary signs, signals, lighting devices, markings, barricades, and channelizing and hand signaling devices in accordance with the South Carolina Manual on Uniform Traffic Control Devices for Streets and Highways to protect personnel and new construction from damage by equipment and vehicles until the surface is approved by the Engineer.

1.8 WARRANTY

A. Contractor shall provide an unconditional maintenance free warranty in writing for all asphaltic concrete paving against defects in workmanship and materials for a period of one (1) year. The warranty period shall begin at the date the final pay request is approved. The warranty shall be executed by the paving subcontractor and cosigned by the General Contractor.

B. Condition at Expiration of Warranty Period: At his own expense and just before expiration of the one (1) year warranty period, the Contractor shall make such repairs as may be necessary to produce a pavement which shall:

1. Have a contour substantially conforming to that of the pavement indicated on the drawings, and free from depressions of any kind exceeding 1/8" deep as measured between any points 4 feet apart on a line conforming substantially to the original contour of the paved area.

2. Be free from cracks or depressions showing disintegration of the surface mixture.

3. Contain no disintegrated surface mixture.

4. Not have been reduced more than 3/8" in thickness in any part.

5. Have a base free from cracks or defects which will cause its disintegration or settling of the pavement.

PART 2 PRODUCTS

2.1 MATERIALS

A. Bituminous Concrete Mix: SCDOT SS, Section 402 and 403, Type C for surface course; Type A for intermediate course.

B. Base Course: SCDOT SS, Section 305.

C. Prime: SCDOT SS, Section 406, MC-30, RC-30 or EA-P.

2.2 MIX PLANT

A. SCDOT SS, Section 401, Type C.

PART 3 EXECUTION

3.1 INSTALLATION AND APPLICATION

A. Provide a base course with a prime coat and a bituminous concrete surface course. Subgrade preparation shall be as specified in Section 02200, "Backfilling".

3.2 BASE COURSE PLACEMENT

A. Begin spreading base material at the point nearest the source of supply. Permit traffic and hauling over the base. Fill ruts formed by traffic and reroll. After base course placement, continue machining and rolling until surface is smooth, compacted, well bonded, and true to the designed cross section. Compact to 100 percent ASTM D 1557 maximum dry density. Maintain the base smooth and true to grade and cross section until asphaltic concrete placement.

B. The completed thickness of the base course shall be within +3/4 inch or -1/2 inch of the required thickness. The average thickness shall not be less than the design thickness.

3.3 APPLICATION OF PRIME COAT

A. The prime coat shall not be applied until the stabilized aggregate base course has seasoned sufficiently to permit a uniform penetration. The base shall be dry when the prime is applied.

B. The rate of application shall be from 0.25 to 0.30 gallons per square yard.

C. When it is necessary to maintain traffic on a road or a section of road before the prime coat has time to sufficiently dry to prevent pickup, the Contractor shall apply sand as a cover. The cost of the material and performing this work shall be included in the cost of the base course or other items of work and no direct payment will be made.

3.4 PLACING ASPHALTIC CONCRETE PAVEMENT

A. Placing Temperature - Minimum temperature of asphaltic concrete during placement into mechanical spreader shall be 250 degrees F. Mixtures which have a lower temperature shall be rejected.

B. Joints - Where new pavement abuts existing bituminous pavement, cut existing surface course along straight lines approximately 6 inches from edge. Cuts shall be vertical and extend full depth of surface course. Prior to bituminous concrete placement, apply asphalt cement to exposed edges of cold joints.

C. Spreading and Finishing Equipment - Spread the bituminous concrete to a uniform density and produce a smooth finish, true to cross section and free from irregularities. Provide adjustable screeds to shape the surface to true cross section.

D. Asphaltic Concrete Placement - As continuous as possible. Place in maximum 2-inch lifts. Avoid passing rollers over unprotected edges of bituminous concrete prior to bituminous concrete cooling. If rollers pass over unprotected edges of bituminous concrete prior to cooling, cut bituminous concrete back to expose full depth of bituminous concrete. Immediately prior to resumption of bituminous concrete placement, coat exposed edges of bituminous concrete with asphalt cement. When bituminous concrete placement resumes, rake the hot bituminous concrete against asphalt cement and compact.

E. Featheredges - Accomplish featheredging by raking out the larger aggregate as necessary and sloping the pavement uniformly throughout the featheredge to create a smooth transition. Unless indicated otherwise, featheredge transition shall be 10 feet.

F. Compaction - SCDOT SS for equipment and compaction procedures, modified to compact bituminous concrete to 96 percent of maximum laboratory density. Finished surfaces shall be uniform in texture and appearance and free of cracks and creases.

G. Protection - No vehicular traffic shall be allowed on pavement for a minimum of 6 hours after final rolling, or until asphaltic concrete has cured, whichever is longer.

3.6 TOLERANCES OF PAVEMENT

A. Flatness: Maximum variation of 1/4 inch measured with a 10 foot straight edge.

B. Compacted Scheduled Thickness: Within -1/4 inch to +1/2 inch of design thickness.

3.7 FIELD QUALITY CONTROL

A. Sampling: Provide new materials where samples are taken.
Take the number and size of samples required to perform the following tests.

1. Bituminous Concrete Sampling

a. Job Mix: Take one initial sample and one sample for every 400 tons or fraction thereof.

b. Thickness: Take one sample for every 500 square yards or fraction thereof.

c. Density: One field test for every 1000 square yards or fraction thereof, and one laboratory test for the project. Provide minimum 4-inch diameter cores.

2. Base Course Sampling

a. Thickness: Take one sample for every 500 square yards or fraction thereof.

b. Density: One field test for every 250 square yards or fraction thereof, plus two (2) tests, minimum, at each street area to receive concrete pavers and one laboratory test for the project.

B. Testing: Provide for each sample.

1. Bituminous Concrete Testing

a. Job Mix: Determine gradation and bitumen content.

b. Thickness: Maximum allowable deficiency shall be 1/4 inch less than the indicated thickness.

c. Density, In Place: ASTM D 2922 and ASTM D 3017; cored sample ASTM D 1188 or ASTM D 2726.

2. Base Course Testing

a. Thickness: Maximum allowable deficiency shall be ½ inch less than the indicated thickness.

b. Density: ASTM D 1556 or ASTM D 2922 and ASTM D 3017.

END OF SECTION

SECTION 02410

PATCHING ASPHALTIC CONCRETE PAVEMENT

PART I GENERAL

1.01 SECTION INCLUDES

A. Patching of existing asphalt pavements or asphalt resurfaced pavements for water lines, sewer lines, storm drains lines or utility service lines.

1.02 RELATED SECTIONS

A. Section 02100 - Excavation.

B. Section 02200 - Backfilling.

C. Section 02500 – Storm Drainage System.

D. Section 02625 – Sewer Force Main Systems.

1.03 REFERENCES

A. SCDOT Standard Specifications, 2007 Edition.

B. SCDOT Manual of Uniform Traffic Control Devices for Streets and Highways, Latest Edition.

C. SCDOT Work Zone Safety Handbook, Latest Edition.

1.04 QUALITY ASSURANCE

A. Perform work in accordance with the SCDOT standards.

B. Obtain materials from same source throughout.

1.05 TESTING REQUIREMENTS

A. Submit proposed mix design of each class of mix for review prior to commencement of work.

1.06 SUBMITTALS

A. Certificates: Provide certificates stating that materials supplied comply with the specifications. Certificates shall be signed by asphalt producer and Contractor.

B. Mix Design: Submit mix design for base and pavement courses to Engineer for acceptance.

1.07 ENVIRONMENTAL REQUIREMENTS

A. Construct asphaltic courses only when atmospheric temperature is above 40 degrees F, when underlying base is dry and when weather is not rainy.

B. Conform to SCDOT Standard Specifications except where more stringent requirements are specified herein.

C. Apply bituminous prime and tack coats only when the ambient temperature in the shade has been at least 60 degrees F. for 12 hours immediately prior to application.

D. Place concrete only when atmospheric temperature is above 40 degrees F.

PART 2 PRODUCTS

2.01 PAVEMENT MATERIALS

A. Primer: Homogeneous medium curing liquid asphalt. Type MC-30.

B. Tack Coat: Type SS-1.

C. Asphalt Cement: ASTM D946. Type AC-20.

D. Aggregate for Mix: SCDOT Type 1.

2.02 ASPHALT PAVING MIX

A. Use dry materials to avoid foaming. Mix uniformly.

B. Topping Course: 4.8 to 6.8 percent of asphalt cement by weight in mixture.

2.03 BASE COURSE MATERIAL

A. The base course material shall be as specified on the drawings and shall conform to the SCDOT Standard Specifications.

2.04 CONCRETE

A. Concrete and reinforcing steel shall conform to requirements of Section 03250.

B. Concrete shall be 3500 psi high early strength.

PART 3 EXECUTION

3.01 INSPECTION

A. Verify compacted trench backfill is dry and ready to support a compacted base course.

B. Verify compacted base course is dry and ready to support paving and imposed loads.

C. Verify that reinforcing steel is lean, of the proper size, properly positioned and free from kinks or other defects before pouring concrete (for patches requiring concrete base).

D. Verify that the concrete base (where required) has set up for the proper length of time before covering patch with asphalt.

3.02 TRENCH BACKFILLING

A. The trench shall be backfilled and compacted in accordance with Section 02200.

B. All trenches across roadways shall be covered at the end of each working day and open to traffic.

C. Trenches shall be brought level with the existing pavement using gravel base for at least the top 6 inches which shall be compacted in place. Any settlement or holes which develop shall be promptly filled by the Contractor at his expense with additional gravel base.

D. Pavement patch shall be brought level with the existing pavement using gravel base for at least the top 6 inches which shall be compacted in place. Any settlement or holes which develop shall be promptly filled by the Contractor at his expense with additional gravel base.

3.03 PATCH PREPARATION

A. The existing pavement shall be sawcut at the required distance form the edge of the trench just prior to the final application of gravel base or concrete as called for on the plans.

B. Immediately after sawcutting the existing pavement as described above the patch area shall be cleaned of extraneous material. The area shall be cleared to the required depth in neat lines and all excess material shall be removed.

1. For patches to receive gravel base, the final application of gravel shall be made and compacted to bring the level up to the required distance below the existing pavement.

2. For patches with concrete base the reinforcing steel (if required) shall be placed in the patch area and supported by concrete block, brick or approved chair supports the proper distance above the sub-base. Reinforcing steel shall not be allowed to rest on the sub-base. After the steel placement has been inspected and approved, concrete shall be poured and the top troweled to an even surface at the required depth below the existing pavement.

3. Concrete shall be allowed to set at least 24 hours. During this time traffic shall be maintained by placing steel plates or other approved or bridging material across the trench. Such bridging shall be at the Contractor's expense.

C. Traffic shall not be allowed to cross the sawcut edges until the final asphalt course has been laid.

3.04 PLACING ASPHALT PATCH

A. The asphalt surface shall be placed as soon as practical after the patch preparation is finished.

B. Prior to placing the asphalt, a primer shall be used if placed over a gravel base. A tack coat shall be used if placed over concrete and shall be used between layers if more than one layer is required. Such primer or tack coat shall be at the Contractor's expense.

C. Place the asphalt within 24 hours of priming the base or placing the tack coat.

D. Place the asphalt to the compacted thickness identified on the plans.

E. Compact pavement by rolling. Do not displace or extrude pavement from position. Hand compact in areas inaccessible to rolling equipment.

F. Develop rolling pattern with consecutive passes to achieve required compaction and even and smooth finish, without roller marks.

G. Asphalt pavement shall meet all SCDOT requirements unless otherwise stated on the plans or in the specifications.

3.05 TOLERANCES

A. Compaction and Density Requirements:

1. Base and sub-base: Compact to 98% as measured by ASTM D698.

2. Asphalt Pavement: Minimum acceptable density of in place material shall be 98% of recorded laboratory specimen density.

B. Allowable Variation in Thickness:

1. Base Course: (+\-) 1/2".

2. Surface (wearing) Course: (+\-) 1/8".

C. Surface Smoothness: Test finished surface of each asphalt course for smoothness using a 10'-0" straight edge. Intervals of tests shall be as directed by the Engineer. Surfaces will not be acceptable if exceeding the following:

1. Base Course: 1/2" in 10'-0".

2. Surface (wearing) Course: 1/4" in 10'-0".

D. Laboratory shall test in place courses for compliance with specified density, thickness and surface smoothness. Contractor shall seek Engineer's approval for testing locations and number of tests.

E. Laboratory shall take two 4" diameter cores per 1,000 sq. yards of paved surface (400 LF of roadway) at locations directed by the Engineer.

F. Contractor's duties relative to testing shall include:

1. Notifying laboratory of conditions requiring testing.

2. Coordinating with Engineer and laboratory for field testing.
3. Paying costs for testing performed and for retesting where initial tests reveal nonconformance with specified requirements.

4. Repair holes resulting from coring to match existing surface.

3.06 TRAFFIC CONTROL

A. Comply with State Manual of Uniform Traffic Devices for Streets and Highways.

B. Maintain vehicular and pedestrian traffic during paving operations as required for other construction activities. Flagmen may be required at busy intersections.

C. Provide flagmen, barricades, warning signs and warning lights for movement of traffic and safety and to cause the least interruption of work.

3.07 MARKING AND SIGNAGE

A. Pavement marking and road signs shall comply with SCDOT and the local municipalities' standards as applicable.

3.08 CLEANING AND PROTECTION

A. At completion of each operation, remove excess or spilled materials from site. Dump or spread no excess asphalt materials on the project site.

B. After placement of surface course, no vehicular traffic shall be allowed on pavement until it has cooled.

END OF SECTION

SECTION 02420

CONCRETE CURB AND GUTTER AND SIDEWALK

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Cast-in-pace concrete curb and gutter construction.

1.2 RELATED SECTIONS

A. Section 01410 - Testing and Laboratory Services.

B. Section 02100 - Excavation.

C. Section 02400 - Asphaltic Concrete Pavement.

D. Section 03250 - Concrete.

1.3 REFERENCES

A. ACI 347 - Recommended Practice for Concrete Form Work.

B. PS 1 - Construction and Industrial Plywood.

1.4 QUALITY ASSURANCE

A. Obtain materials from same source throughout.

1.5 FIELD CONSTRUCTED MOCK-UP

1. Prior to installation of concrete walks, construct sample mock-up panel to verify implementation of each specified finish treatment. Sample panels shall represent complete walk installation, including finishes, edge and joint treatment, for quality of appearance, materials, construction and workmanship. Locate mock-ups at site as directed by the Engineer. Obtain approval of panels from the Engineer prior to beginning installation. Prepare new mock-up panel(s) as necessary to obtain desired appearance. Quality of appearance, materials, construction and workmanship, as established by the approved panel, shall be the standard by which finished work is judged acceptable.
Multiple mock-up panels may be required. Mock-up panel shall be a minimum of 5' x 5' each. Approved panels shall remain in place throughout the duration of the Project, until such time as all walks have been installed and found acceptable by the Engineer, at which time the panel shall be removed in its entirety. Mock-up panel shall not remain part of the finished work.

1.6 ENVIRONMENTAL REQUIREMENTS

A. Do not place concrete in temperatures less than 40 degrees F without Engineer's approval.

PART 2 PRODUCTS

2.1 MATERIALS

A. Concrete Materials: Comply with requirements of applicable Division 3 sections for concrete materials, curing materials and others as required.

B. Forms: Steel, of size and strength to resist movement during concrete placement and to retain horizontal and vertical alignment until removal. Use straight forms, free of distortion and defects. Use flexible spring steel forms to form radius bends as required. Coat forms with nonstaining type coating that will not discolor or deface surface of concrete.

C. Joint Fillers: Resilient premolded bituminous impregnated fiberboard units complying with ASTM D 1751, FS HH-F-341, Type II, Class A; or AASHTO M 153, Type I.

D. Joint Sealants: Standard joint sealant specifically manufactured for intended purpose; Sikaflex® 1C SL or prior approved equal.

2.2 MIX DESIGN

A. Mix design shall comply with requirements of Section 03250.

B. Design mix to produce normal weight concrete consisting of portland cement, aggregate, water-reducing admixture, air-entraining admixture, and water to produce the following properties:

1. Compressive Strength: 3,000 psi, minimum at 28 days, unless otherwise indicated on Plans.

2. Slump Range: 2" - 4" maximum.

3. Air Entrainment: 5% to 8%.

2.3 TREE GRATES

Tree grates as manufactured by Neenah Foundry Company, or approved equal. All grates shall be two-piece, cast iron, with matching cast iron frame. One size is required: overall nominal size of 36" x 48", equal to Neenah R-8814-A, Rectangular.

PART 3 EXECUTION

3.1 INSPECTION

A. Verify reinforcement and other items to be cast into concrete are accurately placed, held securely, and will not cause hardship in placing concrete.

3.2 PREPARATION

A. Form Construction

1. Set forms to required grades and lines, rigidly braced and secured.

2. Clean forms after each use, coat with form release agent as often as required to ensure separation from concrete without damage.

B. Concrete Placement

1. Do not place concrete until subgrade and forms have been checked for line and grade.

2. Place concrete using methods which prevent segregation of mix.

3. Automatic machine may be used for curb and gutter and sidewalk placement at Contractor's option. Machine placement must produce curbs and gutters to required cross section, lines, grades, finish, and jointing as specified for formed concrete. If results are not acceptable, remove and replace with formed concrete as specified.

C. Joint Construction - Curb and Gutter

1. Weakened Joints: Provide joints at intervals of 6 feet maximum. The joint shall be made by cutting the concrete with a trowel or by other acceptable methods. Saw cutting joints shall not be allowed.

2. Expansion Joints: Preformed expansion joints 3/4 or one (1) inch thick, extending the full depth of the concrete curbing, shall be constructed at all radius points, junctions with existing concrete, inlets and manholes, and at not more than 50 foot intervals in continuous runs of curb. Leave expansion joints ½" from level with finished surface. Fill remaining ½" with Sikaflex® 1C SL joint sealer to flush with finished surface. Protect joint sealer until it has cured enough to handle foot and vehicular traffic.

D. Joint Construction - Sidewalks

1. Control Joints: Provide joints at intervals noted on drawings, both ways. The joint shall be made by cutting with trowel or other acceptable means. Saw cutting joints shall not be allowed.
2. Expansion Joints: Preformed expansion joints ½ inch thick, extending full depth of walk to within ½ inch of finished surface. Fill last ½ inch with standard joint sealer, to flush with top of joint. Apply sealant so as to prevent discoloration or defacement of surface of concrete. Provide expansion joints at a minimum of 20 feet on center, both ways; in addition, provide expansion joints where walks abut all existing vertical structures, building foundations, concrete collars, and between existing and new concrete pavements.

E. Joint Construction - Concrete Collars

1. Expansion Joints: Preformed expansion joints ½ inch thick, extending full depth of collar to within ½ inch of finished surface. Fill last ½ inch with Sikaflex® 1C SL joint sealer, to flush with top of joint. Apply sealant so as to prevent discoloration or defacement of surface of concrete. Provide expansion joints at a

minimum of 25 feet on center; in addition, provide expansion joints where collars abut building foundations, existing concrete pavement, walks, new concrete pavement, and all structures.

F. Place concrete continuously between predetermined expansion joints. Do not break or interrupt successive pours such that cold joints occur.

G. Excessive honeycomb or embedded debris in concrete is not acceptable. Notify Engineer upon discovery.

3.3 TREE GRATES:

Install tree grates and frames per manufacturer's recommendations and standard installation details. Frames shall in all cases be secured into surrounding concrete collars.

3.4 FINISHING

A. Curb and Gutter

1. Broom finish by drawing fine-hair broom across concrete surface parallel to line of traffic. Repeat procedure as required to provide fine line texture. Alternate direction of broom finish on adjacent squares of concrete.

B. Sidewalk

1. All concrete walks shall be finished as detailed.

C. Concrete Collar

1. Broom finish by drawing fine-hair broom across concrete surface parallel to length of collar. Repeat procedure as required to provide fine line texture.

3.5 PATCHING

A. Notify Engineer immediately upon removal of forms.

B. Patch imperfections.

3.6 DEFECTIVE CONCRETE

A. Modify or replace concrete not conforming to required levels and lines, details and elevations.

B. Repair or replace concrete not properly placed or of the specified type.

C. Remove and replace defective concrete as directed, at no additional cost to the Owner.

3.7 FIELD QUALITY CONTROL

A. Field inspection and testing will be performed under provisions of Section 01410.

3.8 PROTECTION

A. Protect concrete from damage until acceptance of work.

END OF SECTION

SECTION 02460

THERMOPLASTIC PAVEMENT MARKINGS

PART I GENERAL

1.1 SECTION INCLUDES

A. Application of permanent thermoplastic reflectorized pavement marking materials and associated permanent raised reflective pavement markers.

1.2 RELATED SECTIONS

A. Section 02400 - Asphaltic Concrete Pavement.

1.3 REFERENCES

A. SCDOT Standard Specifications, Latest Edition.

B. SCDOT Supplemental Specifications.

C. FHA Manual on Uniform Traffic Control Devices (SCMUTCD).

PART 2 PRODUCTS

2.1 MATERIALS

A. Thermoplastic Compound: AASHTO M 249 with the following adjustments:

1. The material may be shipped in the granulated form rather than the block form.
2. For longitudinal long line and channelization markings, the material may be either hydrocarbon or Alkyd based.
3. All handwork consisting of stopbars, crosswalks, legends and symbols shall be Alkyd Based Material only.

B. Glass Beads: AASHTO M 247 - Type 1.

C. Primer-Sealer: A primer-sealer as recommended by the manufacturer of the thermoplastic pavement marking material shall be utilized on all Portland Cement pavement surfaces and all bridge surfaces that have not been overlaid with asphalt. The primer-sealer also shall be utilized on any type of pavement prior to the placing of Railroad Crossing Symbols. Primer-sealer shall be used on Asphaltic Concrete pavement surfaces if recommended by the manufacturer of the thermoplastic pavement marking material. The primer-sealer shall form a continuous film which will mechanically adhere to the pavement and shall neither discolor nor cause any noticeable change in the pavement outside of the finished pavement markings.

D. Retroreflective Pavement Markers (RPM): RPMs shall be provided and installed in accordance with ASTM D 4280 and SCDOT Standard Specifications for Highway Construction (2007 edition) Section 630.

2.2 EQUIPMENT

A. Requirements: AASHTO M 249 and as expanded by SCDOT Supplemental Specification.

PART 3 EXECUTION

3.1 PREPARATION OF SURFACE

A. All surfaces to be painted shall be thoroughly cleaned of all dust, dirt, grease, oil, and all other foreign matter before application of the marking paint.

B. When waterborne paint is utilized, temperatures at the heat exchanger of the paint truck shall not exceed 150° F (66° C). Paint shall not dwell in the exchanger for more than two hours.

C. Unless otherwise permitted by the Engineer, no markings shall be applied to areas of pavement when any of the following conditions apply:

1. Any moisture or foreign matter is present on the surface.
2. The air temperature is below 50° F (10° C).
3. The relative humidity is above 85 percent.

D. All markings shall be sufficiently dry before opening to traffic.

E. The wet film thickness for all markings shall be 15 mils. Place glass beads at a minimum rate of six (6) pounds per gallon of paint.

3.2 APPLICATION OF THE PRIMER-SEALER

A. Where used, the primer-sealer shall be sprayed on the pavement surface where the lines are to be applied. The application thickness and curing time on the pavement prior to thermoplastic application shall be governed by the recommendations of the manufacturer of the primer-sealer.

3.3 APPLICATION OF THE MARKING MATERIAL

A. All longitudinal markings shall be placed with a truck-mounted applicator except when approved by the Engineer. Such a case may occur where the length of a particular marking is too short, or the curvature too great, to permit efficient use of the liner. Transverse markings may be applied with a portable unit.

B. The markings shall be straight or of uniform curvature and shall conform uniformly with tangents, curves and transitions. Symbols shall be of dimensions shown in the SCMUTCD. Markings must be of the dimensions and placed as shown on the Pavement Marking Plans. The Contractor shall provide, at his own expense, sufficient control

points to serve as guides for the application of markings.

C. The finished line markings shall be free from waviness and the lateral deviations shall not exceed two (2) inches in fifteen (15) feet. Any greater deviation shall be sufficient cause for requiring the Contractor to remove and correct, at his expense, any symbol markings not meeting the dimensional requirements shown in the SCMUTCD.

D. The Contractor shall protect the markings until dry by placing guarding or warning devices as necessary. In the event any vehicle should cross the wet marking, such a marking shall be reapplied and any tracking lines made by the moving vehicle shall be removed by the Contractor at no additional expense.

E. To avoid poor quality, markings shall be placed only when the surface of the pavement is sufficiently dry as determined by visual inspection and the pavement temperature is minimum 55° F and the air temperature is minimum 50° F. No work will be allowed when any moisture is visible on the pavement surface.

F. Thermoplastic markings to be applied between December 15 and March 15 shall only be applied in the proper weather conditions, as outlined above. The Engineer may disallow application on any days when the weather is cold and/or rainy and there is some question as to whether the surface temperature will be above 55° F for a period of time adequate to obtain quality markings. The Engineer may disallow application on any day when, in the Engineer's opinion, moisture conditions are not satisfactory for obtaining quality markings.

G. An adequate number of personnel experienced in the handling and application of this type of material shall be provided by the Contractor to assure the work is done properly. Work shall be done only during daylight hours, and all markings shall be sufficiently dry, before sunset, to permit crossing by traffic. All protective devices shall be removed before sunset to allow free movement of traffic at night.

H. The marking material shall be applied at a temperature that will provide best adhesion to the pavement and shall be between 390° F and 420° F as recommended by the manufacturer. The material shall be heated uniformly throughout and shall have a uniform disbursement of binder, pigment, and glass beads when applied to the surface of the pavement.

I. All extruded lines 12 inches or less in width shall be applied with a die that equals the width of the line. All extruded lines greater than 12 inches may be applied with two dies whose combined widths equal the width of the line.

3.4 RATE OF APPLICATION

A. Marking Material: Marking material shall be applied at the specified widths and at a rate to result in a new material thickness at the center of the line as specified below:

<u>90 mils (2.3 mm):</u> Edge lines and median lines
(4 inch solid white, 4 inch solid yellow, 4 inch broken yellow)

<u>90 mils (2.3mm):</u> Lane lines (4 inch broken white)

90 mils (2.3mm): Center lines on two-lane roadways
(4 inch broken yellow and 4 inch solid yellow)

125 mils (3.2mm): All others not listed above

The edge of the line shall, under all circumstances, have a thickness not less than 75% of the specified center thickness.

B. Glass Beads: "Drop-on" glass beads shall be mechanically applied to the surface of the marking material immediately after the material is applied to the pavement surface, and while the marking material is still molten to ensure that the beads will be held by and mechanically embedded in the surface of the material. The beads shall be uniformly distributed over the entire surface of the marking and shall be applied at a minimum rate of 12 pounds per 100 square feet of stripe.

3.4 RETROREFLECTIVE PAVEMENT MARKINGS

A. Markers may be bonded to the pavement by using either the epoxy method or the bituminous adhesive method. Ensure that the ambient temperature and road surface temperature during application is at least 50°F for use of the epoxy method or 40°F for use of the bituminous adhesive method of bonding.

B. Installation of the RPMs by either method shall be in accordance with the SCDOT Book.

3.5 WARRANTY

A. The Contractor shall transfer to the Owner the warranty on thermoplastic materials issued by the manufacturer. The Contractor shall also furnish the Owner the normal warranty for material for a stated period beginning with the last date of marking application on the project.

3.6 INSPECTION AND ACCEPTANCE OF WORK

A. All thermoplastic markings shall be inspected for proper line thickness and width, proper adhesion, and proper cycle length. The markings shall also be observed both day and night to determine whether all requirements of the Contract have been met. Any markings failing to have satisfactory appearance, either day or night, shall be reapplied by the Contractor at his own expense.

B. The final acceptance of the thermoplastic pavement markings will be delayed for a period of one-hundred eighty (180) days after the last date of marking on the project to permit observation of performance. The Contractor shall be required to replace any markings or markers that, in the opinion of the Engineer, have not performed satisfactorily during this one-hundred eighty day period due to defective materials and/or workmanship in manufacture or application.

END OF SECTION

SECTION 02500

STORM DRAINAGE SYSTEM

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Storm drainage piping, fittings, and accessories.

B. Catch basins, junction boxes and drop inlets.

1.02 REFERENCES

A. ANSI/ASTM C76 - Reinforced Concrete Culvert, Storm Drain and Sewer Pipe.

B. American Association of State Highway and Transportation Officials Specification M-196.

C. American Association of State Highway and Transportation Officials Specification M-294-94.

1.03 RELATED SECTIONS

A. Section 02200 - Backfilling.

B. Section 02300 - Trenching.

C. Section 03250 - Concrete.

PART 2 PRODUCTS

2.01 DRAINAGE PIPE MATERIALS

A. Reinforced Concrete Pipe: ANSI/ASTM C76, Class III, IV, or V concrete pipe with mesh reinforcement and inside nominal diameter as shown on plans.

B. Corrugated Steel Pipe: Riveted with circumferential seams 3" x 1", and inside diameter as shown on plans unless otherwise noted.

C. Corrugated Steel Perforated Pipe: Riveted with circumferential seams 3" x 1", thirty - 3/8" round holes per square foot of pipe surface for the full 360 degrees and inside nominal diameter as shown on plans unless otherwise noted.

D. Corrugated Polyethylene Pipe: AASHTO M 294-94, type S or SP and inside nominal diameter as shown on plans unless otherwise noted.

E. Corrugated Polyethylene Perforated Pipe: Same as D.

F. Construction Fabric Pipe Wrap: Shall be Marifi 140 N or approved equal.

2.02 CATCH BASINS, DROP INLETS, JUNCTION BOX FRAMES AND GRATES

A. Basin Lid and Frame: Cast iron construction, as specified on the plans. All grates are to be bicycle safe.

B. Manhole castings shall be cast iron meeting ASTM Serial Designation A48-62, Class 30B. They shall be "Anti-Rattle" type.

C. Shaft construction to be 8" concrete brick or reinforced precast concrete basin sections, lipped male/female dry joints; nominal size, 3 feet square unless shown otherwise on the plans.

D. Base Pad: Cast-in-place 3000 psi concrete. Level top surface to receive concrete brick or pre-cast concrete section.

E. All brick or concrete block manholes or catch basins shall have 3/4" grout on outside and inside to seal and waterproof from ground water.

2.03 JUNCTION BOXES

A. Lid and Frame: Cast iron construction, removable lid, nominal lid and frame diameter of 24 inches as shown on the plans.

B. Shaft construction to be 8" concrete brick or reinforced precast concrete basin sections, lipped male/female dry joints; nominal size, 3 feet square unless shown otherwise on the plans.

C. Base Pad: Cast-in-place 3000 psi concrete. Level top surface to receive concrete brick or pre-cast concrete section.

D. Manholes used as junction boxes shall have the following diameters based upon the largest size pipe:

15" pipe	--	4 feet
18" pipe	--	5 feet

E. For larger pipes, pre-cast manhole junction boxes must have prior approval of the Engineer.

F. Pre-cast concrete manholes shall meet ASTM Specifications, Serial Designation C478-64T or latest revision and have "O" ring gasket joints meeting ASTM Specifications, Serial Designation D443-65 or latest revision.

2.04 BRICK

A. Brick shall meet ASTM Serial Designation C26 for common brick, Grade C.

2.05 CEMENT MORTAR JOINTS

A. All concrete pipe shall be laid with cement mortar joints. The mortar mixture shall be one part Portland Cement and two parts clean sand by volume.

B. Only enough water shall be used to make a stiff, workable mortar and no more than 5.5 gallons of water per sack of cement shall be used.

2.06 CONCRETE MATERIALS

A. Portland Cement shall conform to Section 3250 and the specifications of ASTM, Serial Designation C-150-62 or latest revision.

B. Cement shall be stored in a weather-tight enclosure.

C. Hydrated lime shall meet the specifications of ASTM, Serial Designation C207-49, or latest revision.

D. Fine aggregate shall conform to the following ASTM Specifications, latest revisions:

1. For concrete: Serial Designation C33-66T
2. For masonry mortar: Serial Designation C144-62T

E. Coarse aggregate for concrete shall consist of crushed granite conforming to the current ASTM Specifications C33. Aggregate shall be cleaned, hard and uncoated.

F. Water for mortar and concrete must not be contaminated by salt, oil, acid or other material which may be harmful.

2.07 REINFORCING STEEL

A. Reinforcing steel shall be of the lengths and sizes shown on the plans.

B. Reinforcing steel shall be of approved deformed typed and meet all requirements of ASTM Standard Specifications for new Billet Steel Reinforcement Bars, Serial Designation A150-62T. Bars will be structural or intermediate grade open hearth steel.

2.08 BACKFILL MATERIALS

A. Reused or imported subsoil as specified in Section 02200 and approved by the Engineer.

B. Type B for any pipe crossing beneath roadways.

C. Type C shall be utilized in areas of poor soil conditions as directed by the Engineer.

PART 3 EXCAVATION

3.01 EXAMINATION

A. Contractor shall notify Engineer so the trench cut or excavation base can be verified if it

is ready to receive work and excavations, dimensions and elevations are as indicated on drawings.

B. Beginning of installation means acceptance of existing conditions.

3.02 PREPARATION

A. Hand trim excavations to required elevations. Correct over excavation with fill material of fine aggregate.

B. Remove large stones or other hard matter which could damage drainage tile or impede consistent backfilling or compaction.

3.03 INSTALLATION - PIPE

A. Lay pipe to slope gradients noted on drawings with maximum variation from true slope of 1/8 inch in 10 feet.

B. Increase compaction of each successive lift. Do not displace or damage pipe when compacting.

C. Storm drain pipe and appurtenant structures shall be installed in accordance with Section 02300 - Trenching and Section 02200 - Backfilling.

D. All pipe shall be laid with the bells uphill.

E. Clean the pipe ends and wet before the joint is made.

F. Apply stiff mortar to the lower half of the bell of the pipe already laid and the upper half of the tongue of the pipe to be laid. The joint shall then be made and drawn tight. Bitumastic joints are required for concrete pipe.

G. Additional mortar shall be applied to the outside to fill any unfilled portion of the groove.

H. Backfill shall be done so as not to disturb the mortar joints.

I. Fill must be approved by the Engineer before placement.

J. Spoil from the excavation may not be utilized at these locations unless specifically approved by the Engineer.

K. In all locations where storm water drainage pipe crosses beneath roadways, select granular fill shall be used to backfill above the pipe.

L. When completed, each pipe line shall show a neat circular bore when lamped.

M. Prior to placing perforated pipe and after the trench has been excavated, place an approved construction fabric in the trench, place a bed of Class 1 gravel on the fabric, install the perforated pipe on the gravel bed and backfill over pipe with Class 1 gravel and compact. Overlap fabric over pipe, backfill and compact remainder of trench with select material.

3.04 INSTALLATION - CATCH BASINS, DROP INLETS AND JUNCTION BOXES

A. Form bottom of excavation clean and smooth to correct elevation.

B. Form and place cast-in-place concrete base pad with provision for storm sewer pipe end sections.

C. Establish elevations and pipe inverts for inlets and outlets as indicated.

D. Mount lid and frame level in grout, secured to top cone section to elevation indicated.

E. Inverts shall be smooth with uniform slopes from invert to invert.

F. Brick structures shall have every fifth course of brick laid as headers. Other courses shall be stretchers.

G. All mortar joints shall be full.

H. Inside mortar joints shall be rubbed full and struck.

I. The inside and outside of the brick work shall be covered with 0.5 inches of mortar.

3.05 FIELD QUALITY CONTROL

A. Testing shall be in accordance with General Provisions.

3.06 PROTECTION

A. Protect pipe from damage or displacement until backfilling operation is in progress.

B. Protect drainage piping and catch basins from siltation during construction with the use of filter fabric.

END OF SECTION

SECTION 02625

SEWER FORCE MAIN SYSTEMS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Sewer Force Main piping, fittings, and accessories.

B. Sewer Pump Station piping, fittings, checks, and valves.

1.02 RELATED SECTIONS

A. Section 02200 - Backfilling.

B. Section 02300 - Trenching.

C. Section 03250 - Concrete.

1.03 REFERENCES

A. ANSI/ASTM A377 - Ductile Iron Pressure Sewer Pipe.

B. ANSI/ASTM A48 - Gray Iron Castings.

C. ANSI/AWWA C-110/A21.10 p Ductile Iron Fittings for Dimensions with 80-60-03 Metal per ASTM A339-55.

D. ANSI/ASTM D2774 - Recommended Practice for Underground Installation of Thermoplastic Pressure Piping.

E. ANSI/ASTM D2241 - Polyvinyl Chloride (PVC) (SDR 26) (160 psi) Sewer Pipe.

F. ANSI/ASTM A21.11 - Rubber Gasket Joints for Cast Iron Ductile Iron Pressure Fittings.

G. AWWA C900 - Polyvinyl Chloride (PVC) Pressure Pipe.

H. AWWA C600 - Installation of Gray and Ductile Iron Pressure Pipe and Fittings.

I. ANSI/AWWA C104 - Cement Mortar Lined Ductile Iron Pipe.

J. ANSI/AWWA C151 - Ductile Iron Pipe, Centrifugally Cast in Metal Molds or Sand Molds, for Water or Other Liquids.

K. ANSI/ASTM C478 - Precast Concrete.

L. AWWA C600.4 - Testing of Sewer Force Mains.

1.04 REGULATORY REQUIREMENTS

A. Conform to applicable code for materials and installation of the Work of this Section.

1.05 SUBMITTALS

A. Submit all product data.

B. Submit product data for pipe, pipe accessories, manholes, manhole accessories, valve and valve accessories.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. U.S. Pipe

B. American Cast Iron Pipe Company.

C. Griffin Pipe Products Company.

D. McWane Cast Iron Pipe Company.

E. J M Pipe and Pipe Products.

F. Scepter Pipe.

G. DeZurik - Plug Valves.

H. Clow Corporation.

I. Mueller Company.

J. Crispin - Air Valves. (Multiplex Manufacturing Co.)

K. M & H Valve & Fitting Co.

L. Vulcan - Water Tight Manholes.

M. Sumter Machinery Company Inc. - Standard Manhole Frames and Covers.

N. Tindall Concrete Products Inc. - Manholes.

O. Thunderline Corporation - Link Seals.

P. Substitutions: Under provisions of Section 0550.

2.02 GENERAL

A. These specifications shall apply to the materials to be furnished and installed to complete the sewer force main installations in accordance with the plans.

B. All pipe and fittings shall be of the class and type as indicated on the plans and/or proposal and designated here within.

C. Intermixing of different types of pipe will not be permitted unless specified on the plans or with approved written permission by the Engineer.

D. All pipe shall be of first quality with smooth interior and exterior surfaces, free from cracks, blisters, honeycombs and other imperfections, and true to theoretical shapes and forms throughout the full length.

E. All pipe shall be subject to the inspection of the Engineer at the pipe plant, trench, or point of delivery, for purpose of culling and rejecting pipe (independent of laboratory test), which does not conform to the requirements of these specifications. Such pipe shall be marked by the Engineer, and the Contractor shall remove it from the project site upon notice being received of its rejection.

F. All sewer force mains installed shall be Polyvinyl Chloride (PVC) pipe for force mains 16 inches in diameter of less.

G. All sewer force mains buried greater than 14 feet in depth shall be bedded in Class 1 materials 1 foot above the crown of the pipe.

H. As specific specifications are cited, the designation shall be construed to refer to the latest revision under the same specification number, or to superseding specifications under a new number, except for provisions in revised specifications, which are clearly inapplicable.

I. All sewer force main materials shall conform with one or more of the specifications cited for each material classification noted below.

2.03 SEWER FORCE MAIN MATERIALS

A. Ductile Iron Pipe:

1. Pipe shall be Class 350, sewer coat lined pipe and conform to the following standard specifications: ANSI/AWWA C-151/A21.51, ASTM 746, and federal specification WW-P-421-D.

2. Cast Iron and Ductile Iron pressure pipe must conform to ASTM A-377, latest revision.

3. Pipe shall be mechanical, push-on, flanged, or boltless ball joint (as needed or as shown on the plans) and conform to standard A21,11 (AWWA C-111) and federal specification WW-P-421-C; for flanged joints ASA-B-16.1 and for boltless ball joints ASA-B-16-B.

4. Boltless ball joints shall lock and be watertight and permit a deflection of up to 15 degrees. The locking device shall include a spherical socket, spherical retainer and lead locking wedge.

B. Polyvinyl Chloride Pipe (PVC)

1. PVC Pressure pipe shall be in accordance with the requirements of ASTM D2321, latest revision; ASTM D2241, latest revision; and shall bear the National Sanitation Foundation Seal.

2. Pipe 4 inches in diameter and greater shall be DR-25 - C900. (AWWA C900).

3. Pipe less than 4 inches in diameter shall be SDR 21.

4. Rubber rings shall be of uniform solid cross-section and conform to ASTM D1869 or the manufacturer's recommendations.

C. Plug Valves

1. All Sewer Force Main Valves shall be plug valves (unless otherwise noted).

2. Plug valves shall be Pratt, or DeZurik series 100 only.

3. Plug valves buried in the ground shall be furnished with mechanical joint type end connections and a standard 2 inch square operating nut.

4. Plug valves shall be epoxy coated inside and out.

5. Plug valves located inside sewer pump stations or buildings are to be flanged with hand-wheel actuators.

6. All plug valves shall be eccentric plug valves unless otherwise specified.

7. All plug valves shall be rated for 175 psi water working pressure and 350 psi hydrostatic test pressure.

8. All plug valves shall be 100% ported and gear actuated.

D. Tapping Sleeves & Valves

1. Tapping sleeves will be true mechanical joints (no fabricated sleeves). Mueller model H-615 or approved equal.

2. All tapping sleeves will be for cast iron, ductile iron, or PVC pipe. (Unless otherwise noted).

3. All tapping valves shall be Mueller model H-687 or approved equal. Tapping valve shall be laid on side with plug valves attached as operating unit.

4. Tapping valves shall have a standard 2 inch square operating nut.

E. Valve Box

1. Valve boxes shall be cast iron adjustable screw type with extension to grade.

2. As required, extension stems shall be provided to raise valve operating nut to 36 inches below grade.
3. Each valve box is to be mounted flush with the proposed grade.
4. Two (2) Concrete Bricks will be required between the valve and valve box.
5. Valve boxes in grassed areas shall have a precast concrete collar mounted flush with the final grade.
6. Valve boxes in pavement areas shall be brought flush with the final grade.
7. Valve boxes to read "SEWER" on the top cover.

F. Check Valves

1. Check valves shall not be direct or buried.
2. Check valves installed in sewer pump stations or valve vaults that are to be installed in the horizontal or vertical direction shall be a flanged lever and spring operation check valve, M & H model 259-02 or approved equal.

G. Sewer Air Release Valves

1. All air release valves shall be A.R.I. Model D-025 with back flushing nose, quick disconnect, couplings ½" shutoff, 1" diameter or approved equal.
2. Stainless steel quick disconnect coupling by OPW Kamlock 2" with gasket.
3. Valve inlet shall be 2 inches in diameter and shall be furnished with a 2 inch stainless steel ball valve with lever handle: Hammond No. 0433 or No. V108-32 or approved equal. Installed with handle up for opening.

2.04 PIPE ACCESSORIES

A. Fittings: Same material as pipe, molded or formed to suit pipe size and end design, in required "T:, bends, elbows, clean out, reducers, traps, and other configurations required unless otherwise shown on plans.

B. Link Seal: Wall seals for all pipe entering pump station shall be installed in accordance with the manufacturer's installation instructions. All link seals shall be grouted in place after pipe placement.

2.05 MANHOLES

A. Frame and Cover: Iron castings conforming to ANSI/ASTM A48, Class 30C iron. Minimum manhole cover diameter shall be 23 inches, and the manhole ring and cover assembly shall not weigh less than 285 pounds. For elevations above the 50 year flood level, frames and covers shall be U.S. Foundry USF 668 Ring KL cover, or approved equal. For elevations below the 50 year flood level, frames and covers shall be watertight U.S. Foundry USF 579 Ring and DC-SSG cover, or approved equal.

B. Manholes to be in accordance with City standards.

C. Manhole Steps: Neoprene coated steel steps cast into manhole wall, 11 inches square and projecting from the wall 6 inches. Steps are to be a maximum of 16 inches on center.

2.06 FILL MATERIAL

A. Ductile Iron Pipe: Approved subsoil as specified in Section 02200.

B. Polyvinyl Chloride (PVC) Plastic Pipe: Bed in accordance with bedding detail on plans using material specified in Section 02200.

PART 3

3.01 GENERAL

A. The Contractor shall furnish all material and labor, and construct the sewer force mains shown on the plans, including all clearing, grubbing, excavating, sheathing, backfilling, foundations, manholes, and other appurtenances, as shown on the plans or specified.

B. The work shall include all ditching, diking, pumping, bailing, draining, dewatering, flushing, testing, and all provisions necessary to protect and maintain buildings, fences, water and gas pipes, drainage culverts, power and telephone lines and cables, and other structures.

C. The Contractor shall be responsible for the cleaning away of all rubbish, surplus materials, and the furnishing of all materials, tools, implements, and labor required to build and put in complete working order the specified sewers and all structures appertaining thereto.

D. All sewers and appurtenances shall be cleared of all foreign debris.

3.02 SURVEYS, POINTS, AND INSTRUCTIONS

A. The Owner, through the Engineer, shall furnish control survey lines and grades as may be necessary. The Contractor shall create his own alignment between each horizontal control points and be responsible for establishing elevations of said points. This shall not relieve the Contractor of the responsibility to make careful and accurate measurements and for constructing the work accurately to the lines and grades furnished by the Engineer.

B. The Contractor shall give the Engineer reasonable notice (48 hours minimum) of his requirements for such control survey lines and grades as he may require.

C. The Contractor shall furnish and place, as directed, all necessary guide boards and appurtenances, and give such other incidental assistance at the site as may be required by the Engineer for staking out the work.

D. The Contractor shall temporarily suspend construction operations which interfere with the Engineer's activities. Operations will be suspended for as long as the Engineer deems necessary.

E. The Contractor shall carefully preserve the points furnished by the Engineer.

F. The Contractor shall receive no extra compensation for any materials or services furnished by him incidental to these operations of the Engineer.

3.03 ORDER OF WORKS

A. The Owner reserves the right to direct the Contractor as to which portions of work should be constructed first, and upon order of the Engineer to verify that any complete portion of work is as specified and acceptable for service.

3.04 HIGHWAYS, STREETS, AND PUBLIC PROPERTY

A. The Contractor's operations in highways or public streets shall be confined to as small a space as is practicable, so as not to cause undue inconvenience to the public or abutting properties, and shall be subject to the approval of the Engineer.

B. The Contractor shall obtain, by agreement with property owner, any additional space required for construction on private property at no cost to the Owner of the Project.

C. The Contractor shall fully adhere to the SCDOT Encroachment Permit and all other encroachment permits while operating in any public right-of-way.

D. Roadway crossings shall be accomplished by open ditch construction or by boring under pavement as required by the State.

E. All materials and modes of operation shall be approved by the Engineer prior to the start of work.

F. Pavement, base, and subgrade courses which must be removed for constructing sewers and appurtenances in or across highways, roadways, and streets shall be replaced with the same general class and type of material used in the initial construction unless specified differently on the plans or in the specifications.

G. Through traffic shall be maintained at all times during construction of sewers across all streets and highways. If the open cut method is used, two separate cuts must be made and one lane of traffic must be open at all times.

H. All construction techniques shall comply with current editions of the State Highway Department Standard Specifications and Traffic Control Manual.

I. The Contractor shall provide suitable bridges, approved by the Engineer, for any area where traffic will cross a trench.

3.05 EXISTING UTILITIES AND STRUCTURES

A. The Contractor shall give written notice (copy to the Engineer) to all Highway Departments, Municipalities, and Public Service Corporations whose poles, wires, pipes, conduits, survey monuments, bench marks, or other structures/utilities may be affected by his operations.

B. Any existing utilities, structures, monuments, damaged by the Contractor shall be repaired or replaced by the Contractor at his own expense.

C. The approximate position of certain known underground lines are shown on the plans for information only. Existing small service lines are not shown.

D. The Contractor shall locate all utilities by use of an electronic pipe locator or other satisfactory methods.

E. The Contractor shall excavate and expose all existing underground lines in advance of trenching operations.

F. The Contractor may, with the Owner's or Engineer's consent, remove any obstructions to his operations, but the obstructions shall be removed and replaced at the Contractor's expense.

G. Removing and relaying of such lines and appurtenances due to interference with the proposed line and grade, in the opinion of the Engineer, will be completed at the expense of the Contractor, unless otherwise shown on the plans or in the contact documents.

3.06 POTABLE WATER PROTECTION

A. Adequate provision shall be made for the protection of potable water supplies from possible leakage from sewers located near water lines.

B. There shall be no physical connection between a public water supply system and a sewer system.

C. Where possible, sewer mains should be located at least ten (10) feet horizontally from existing or proposed water mains. If local conditions prevent a lateral ten (10) foot separation or a sewer is to cross a water main then:

1. Sewer will be laid in a separate trench, with the elevation of the top of the sewer main at least eighteen (18) inches below the bottom of the water main, or;

2. Sewer will be laid in a separate trench as the water main with the water main located on a bench of undisturbed earth, and with the elevation of the top of the sewer at least eighteen (18) inches below the bottom of the water main, or;

3. If local conditions prevent the eighteen (18) inch vertical separation, then the sewer will be laid under the water main and both the water and the sewer shall be constructed of ductile iron pipe for a distance of ten (10) feet on each side of the crossing. The water and sewer lines will be pressure-tested to assure water tightness prior to backfilling.

D. When conditions require a sewer line to cross over a water main, both the water main and sewer line shall be constructed of ductile iron pipe for a distance of ten (10) feet on each side of the crossing. The sewer main pipe shall be centered at the crossing and both water and sewer lines will be pressure-tested to assure water tightness prior to backfilling.

E. If conditions arise which prevent application of the above techniques, Contractor shall obtain written approval from the Engineer prior to construction of the specific problem area.

F. Water/sewer line separation shall be in accordance with Section R62-58-4D(12) of the State Primary Drinking Water Regulations.

3.07 LIGHTS AND PROTECTION

A. The Contractor shall erect and maintain such strong and suitable barriers and such warning lights as will effectively prevent the occurrence of any accident to health, limb, or property.

B. Lights shall be maintained between the hours of sunset and sunrise, during any period of low visibility or as directed by the Engineer.

C. Where pipe lines are to be constructed in the streets, highways or roadways, the Contractor shall take all precautions and comply with all requirements, as may be necessary, to protect the improvements, including installation and maintenance of warning signs, lights, and barricades for the protection of traffic.

3.08 EXCAVATION

A. Contractor to excavate in accordance with Section 02100 and the following.

B. The Contractor shall do all excavation of whatever substances are encountered to the depth shown on the plans.

C. Prior to any excavation, Contractor shall provide adequate protection (as long as necessary to prevent damage) for any part or parts of the project site to remain (lawns, sidewalks, fences, landscape, hydrants).

D. Any and all damaged items shall be repaired or replaced in such a manner that the items in question are returned to their original or better condition at the Contractor's expense.

E. Unstable soil shall be removed and replaced with mechanically tamped gravel or crushed stone at no additional cost to the Owner. The Engineer shall determine the depth of removal of unstable soil.

F. Excavation for manholes shall have a minimum of twelve (12) inches clearance on all sides.

G. Remove any water accumulated in excavation at no additional cost to Owner.

H. Excavation shall not be carried below the required level. Excess excavation below the required level shall be backfilled at the Contractor's expense with earth, sand, gravel, or concrete, as directed by the Engineer, and thoroughly tamped to the required proctor.

I. At locations where existing walls or fences will be removed to permit the installation of the proposed sewer line, the Contractor shall remove and reset the wall/fence as rapidly as practicable to permit the installation. Fences/walls shall be reset in their original

location in condition equal or better than prior to their removal. The Contractor will be required to establish temporary fencing or barriers for protection of children, livestock, during construction.

3.09 TRENCHING

A. Contractor to construct all trenching in accordance with Section 02300 and the following.

B. Trench width shall be wide enough to provide adequate space for workman to place and joint the pipe properly.

C. Trench bottom to be rounded to allow pipe to rest firmly on undisturbed soil or compacted bedding.

D. Bell hoes shall be excavated accurately to size by hand. In rock, excavation shall be carried 6 inches below the bottom of the pipe. Loose earth or gravel shall be used for backfill and tamped thoroughly.

E. Contractor shall provide and use all bracing, sheathing, and shoring necessary to perform and protect all excavations as shown on the plans, as required for safety, as directed by the Engineer, or to conform to governing laws.

F. Excavated material shall be stockpiled on the Owner's property and located in such a manner to prevent interference with any traffic, and existing or proposed structures or utilities.

G. Equipment, materials, trenches, and excavations which may cause a hazard or serve as obstructions to either vehicular or pedestrian traffic, shall be enclosed by fences or barricades, adequately lighted, to protect persons from injury and to avoid property damage.

H. The Contractor shall furnish temporary support, adequate protection and maintenance of all underground and surface structures, drains, sewers, and other obstructions encountered in the process of work.

I. Where traffic must cross open trenches, the Contractor shall provide suitable bridges, which shall be subject to approval by the Engineer.

J. All applicable safety requirements of OSHA must be followed.

K. Trenches shall be properly dewatered prior to placement of the pipe. Where running sand is encountered, well pointing method will be used. If soil conditions prohibit the well pointing method, then french drains of crushed stone or gravel shall be constructed to drain to suitably located sumps and the water removed by bailing or pumping. The Contractor shall provide all labor, materials, tools, and equipment reburied for the dewatering process at no additional cost to the Owner.

L. Not more than 200 feet of trench shall be opened in advance of pipe laying unless otherwise approved by the Engineer.

M. Wherever the subgrade is by nature too soft or mucky, in the opinion of the Engineer, for the proper installation of the sewer force main, he may order the Contractor to undercut the trench and backfill with crushed stone or gravel, 3/4" in size and less.

N. Trenches shall be excavated a sufficient distance in advance of laying the pipe, to prevent the entry of ground water, earth or debris during the construction. The exposed end of all pipes shall be fully protected with a watertight stopper to prevent water, earth, or other substances from entering the pipe during periods when work is not in progress.

O. The invert profile, as shown on the plans, shall be followed except where changes are authorized in writing by the Engineer to avoid existing structures or to conform to the topography.

P. The depth of the trench shall be increased where necessary to provide a smoothly curved profile or to avoid existing structures.

Q. The trench shall be excavated in such a manner as to provide uniform and continuous bearing and support for the pipe, and excavated to the depth required to give a minimum of 36 inches of cover for the pipe from the finished grade to the top outside of the pipe barrel, except under roadways where the minimum cover shall be 30 inches from the subgrade to the top of the pipe barrel and at air release valves where the minimum cover shall be 54 inches from the subgrade to the outside top of the pipe barrel.

R. The depth of cover may be modified at creek crossings or at other dips in the profile, when approved by the Engineer, provided that the cover is not less than 36 inches for more than one full station (100 feet).

S. Bell holes shall be provided at each joint to permit the joints to be "made-up" properly.

T. Where the soil at the bottom of the trench is not uniformly good, and stone, dry clay, hard pan, shale, or cemented gravel is exposed, the trench shall be excavated to at least three inches and not more than six inches below the specified grade, and shall be backfilled to grade with material, approved by the Engineer, containing no rocks, gravel or cinders, in layers not to exceed four inches loose depth. The bedding shall be finished by means of hand tools so as to provide uniform and continuous bearing and support for the pipe.

U. Where the bottom of the trench at grade is found to be unstable, or includes ashes, cinders, all types of reuse, vegetable or other organic material, the Contractor shall excavate and remove such unsuitable material to the width and depth ordered by the Engineer. The trench shall be backfilled to bedding grade with approved material in four-inch layers to loose depth. Each layer shall be thoroughly compacted to a density specified by the Engineer. The bedding shall be finished by means of hand tools so as to provide a uniform and continuous bearing and support for the pipe. There will be no additional compensation for such excavation and backfill.

V. Where the bottom of trench grade is found to consist of material which is unstable to such a degree that, in the opinion of the Engineer, it cannot be removed and replaced with material suitable to support the pipe properly, the Contractor shall construct a foundation for the pipe, consisting of concrete, pilings, timber, or other suitable materials, as directed by the Engineer. Special foundations, if not called for on the plans, shall be paid for in accordance with the proposal, or at a price agreed upon by the Owner and Contractor and

approved by the Engineer.

3.10 EXAMINATION

A. Verify that trench cut and excavation base is ready to receive work, and excavations, dimensions, and elevations are as indicated on Drawings.

B. Beginning of installation means acceptance of existing conditions.

3.11 PREPARATION

A. Hand trim excavations to required elevations. Correct over excavation with fill material of fine aggregate.

B. Remove large stones or other hard matter which could damage drainage tile or impede consistent backfilling or compaction.

3.12 INSTALLATION - PIPE

A. General

1. Install PVC pipe, fittings and accessories in accordance with ANSI/ASTM C151, ANSI/ASTM D2774, latest revisions and manufacturer's instructions. Install ductile iron pipe, fittings and accessories in accordance with AWWA C-600, latest revision and manufacturer's instructions. Seal joints watertight.

2. All pipes and fittings shall be protected during handling against impact shocks and free fall. Pipes and fittings shall be cleaned before they are laid, and shall be kept clean at all times.

3. All pipe and fittings shall be carefully examined for defects and no piece shall be laid which is known to be defective. Before lowering, and while suspended, cast and ductile iron pipe may be gently tapped with a hammer to sound for cracks. Any defective, damaged, or unsound pipe shall be rejected.

4. If any defective piece shall be discovered after having been laid, it shall be removed and replaced with a sound one at the Contractor's expense.

5. The pipe shall be supported its full length by the uniform grade of the trench, and a bell hole shall be dug at each joint, said hole being of sufficient size to ensure the proper "making up" of each joint.

6. Pipe ends shall not be left open such as at the end of a day's work or during temporary suspension of construction, but shall be securely covered to prevent the entry of foreign matter or small animals.

7. Kinks or sharp bends giving excessive deflection or which put pipe joints in strain will not be permitted.

8. Horizontal and vertical curvature, where fittings are not specified, can be obtained by cutting pipe to short lengths. Under no circumstances will pipe at any joint exceed the Manufacturer's recommendations.

9. When cutting short lengths of pipe, a pipe cutter will be used, and care will be taken to make the cut at right angles to the centerline of the pipe. In the case of "push-on" pipe, the cut ends shall be tapered with a portable grinder or coarse file to match the manufactured taper.

10. Where the use of nuts, bolts, washers, rods, straps, and clamps are required due to the peculiarities of the installation, these items shall be installed and be of the size and dimension as shown on the plans. After installation, and before backfilling, all the above items shall be painted with bituminous paint or coal tar enamel. In lieu of the above, accessories and fittings shall be provided using stainless steel or other non-corrosive metals.

11. Any pipe, fitting, or accessory not meeting the specified ASTM Standard shall not be used.

12. Place pipe on approved bedding in accordance with the plans and specifications.

13. Lay pipe to slope gradient noted on Drawings.

14. Pipe lying shall begin at the lowest grade point with spigot ends pointing down grade and forming a uniform invert.

15. Pipe shall not be placed on blocking at any time unless approved by the Engineer, and then only at manholes or other structures where temporary blocking may facilitate installation of the pipe. After the pipe has been installed, all blocking shall be removed and all voids filled with select material and compacted in place.

16. Increase compaction of each successive lift. Do not displace or damage pipe when compacting.

B. "Push-On" Joint Pipe

1. "Push-On" type joints, such as "Ring Tite", "Fastite", or approved equal, shall be prepared by removing all dirt or foreign material from the bell end of the pipe and inserting the gasket.

2. The spigot end of the pipe shall be prepared by cleaning and applying a thin coat of approved lubricant after which the spigot end is centered in the bell and jacked on by using a special jack and choker sling.

3. The procedure in making up this joint shall be performed in accordance with the recommendations of the manufacturer.

C. Mechanical Joint Pipe

1. When "making-up" mechanical joints, the spigot end of each pipe shall be entered into the adjoining bell to within 1/8 inch of the total depth of the bell.

2. The pipe shall be properly centered and have uniform space all around for reception of the packing material.

3. The packing material, bolts, nuts, and other accessories used in making mechanical or sleeve type joints shall be obtained from the manufacturer of the pipe.

4. The surface of the spigot and bell are to be brushed thoroughly with a wire brush just prior to assembling. The spigot end is to be brushed with soapy water just prior to slipping the gasket on and entering it into the bell.

5. When tightening bolts, it is essential that the gland be brought up to the pipe flange evenly, maintaining approximately the same distance between the gland and the face of the flange at all points around the socket. This is to be done by partially tightening the bottom bolt first, then the top bolt, next two bolts at either side, and last, the remaining bolts. Repeat this cycle until all bolts are within the range of the torques listed below:

BOLT SIZE DIA.	RANGE OF TORQUES FT./LBS.
5/8"	40 - 60
3/4"	60 - 90
1"	70 - 100
1-1/4"	90 - 120

If effective sealing is not obtained at the maximum torques indicated above, the joint must be disassembled and reassembled.

D. Flanged Joint Pipe

1. All flanged faces shall be free of all dirt or foreign material. Each face shall be cleaned prior to installing the gasket.

2. Flanges should be inspected to make sure that the flange is true and the bolt holes line up with each other.

3. Flanges should be tightened to the proper torques listed in Section 3.12.C above.

E. Steel Pressure Pipe

1. Steel pressure pipe may be jointed by butt welding, lap welding, or in any other manner recommended by the manufacturer.

3.14 INSPECTION

A. All work done and materials furnished shall be subject to the inspection of the Engineer.

B. All improper work shall be reconstructed at the Contractor's expense.

C. All materials which do not conform to the requirements of the specifications shall be removed from the work upon notice being received from the Engineer of the rejection of such materials. The rejected materials shall be removed and replaced with approved materials at the Contractor's expense.

D. The Engineer reserves the right to mark rejected materials to distinguish them as such.

3.15 THRUST BLOCKING

A. No thrust blocking will be allowed. The pipe sections must be restrained in accordance to Paragraph 3.16.

3.16 RESTRAINED JOINTS AND PIPE

A. Restrained pipe and fittings shall be installed only in the areas specified on the plans or as directed by the Engineer or as required by the local municipality.

B. Acceptable methods for joint restraint shall be the use of metal rods or EBAA Iron In., MEGA LUG or approved equal.

C. Retainers for pipe bells shall be required with the use of the MEGA LUG restraints.

3.17 BACKFILLING

A. Contractor to backfill in accordance with Section 02200 and the following.

B. All trenches and excavation shall be backfilled immediately after the pipes are laid therein, unless other protection of the pipeline is directed.

C. The backfilling materials shall be selected and deposited with special reference to the future safety of the pipes.

D. Backfill material shall be free from cinders, ashes, refuse, vegetable or other organic materials, boulders, large rocks, or stones. However, from one foot above the top of the pipe to the original ground or to subgrade, material containing stones up to four inches in their greatest dimension may be used, unless otherwise directed by the Engineer.

E. The backfill material shall be deposited in the trench for its full width in six-inch layers loose depth to the height of one foot above the pipe. Except where special methods of bedding and tamping are provided for, clean earth, sand, or rock dust shall be solidly tamped and compacted as hereinafter described.

F. Backfilling shall not be done in freezing weather, except by permission of the Engineer, and it shall not be done with frozen material. No backfilling shall be done where the material already in the trench is frozen.

G. From the bottom of the trench to the centerline of the pipe, the backfill material shall be placed by hand and compacted with approved hand tamps to the required proctor. From the centerline of the pipe, to a height of one foot above the pipe, the backfill shall be placed by hand and compacted by use of approved mechanical tampers to the required proctor. The Contractor shall use special care in placing this portion of the backfill so as to avoid injuring or moving the pipe. The remainder of the backfill in the trench shall be placed by hand or mechanical means in the specified lifts and compacted by the approved mechanical tamper to the specified proctor.

H. Walking or working on the completed pipe lines, except as may be necessary in tamping or backfilling, shall not be permitted until the trench has been backfilled to a height of at least two feet over the top of the pipe.

I. After placing the backfill up to a level slightly below the natural ground surface, surplus excavation shall be bermed and maintained in a suitable manner as to concentrate and pond runoff from rains over the trench. After sufficient settlement has been obtained, in the opinion of the Engineer, the Contractor shall complete the dressing, removal of surplus materials, and surface cleanup in accordance with these specifications.

J. Whenever the trenches have not been properly filled, or if settlement occurs, they shall be refilled, smoothed of, and finally made to conform to the surface of the ground. Backfilling shall be carefully performed and the original surface restored to the full satisfaction of the Engineer.

K. Backfill in open trenches across sidewalks and in roadways shall be made as specified above, except that fill above the pipes shall be deposited in layers not to exceed six inches and thoroughly compacted to the specified proctor.

L. Excess material not needed for backfill, and material unsuitable for backfill, shall be removed form the site and disposed of as directed by the Engineer.

M. Additional backfill material as required to make up deficiency, or to replace unsuitable excavated material, shall be furnished by the Contractor at no additional cost from approved borrow pits or from excavations on roadways.

N. The Contractor shall backfill the trench to the original grade or as specified in the plans.

O. The construction site shall be left in a neat and orderly condition to the Engineer's satisfaction.

3.18 TESTING AND LEAKAGE ALLOWANCE

A. Leakage is defined as the quantity of water that must be supplied into the newly laid pipe or any valved section thereof to maintain the specified test pressure after the air in the pipeline has been expelled and the pipe has been filled with water. The allowable limits for leakage of underground piping shall be determined by the following formula.

B. Each completed section of the pipeline shall be plugged at both ends and slowly filed with water. As the force main is being filled for the hydrostatic pressure test, all air shall be expelled from the pipe through blowoffs, air release valves, or temporary taps.

C. The force main shall be subjected to a hydrostatic pressure of 150 pounds per square inch for a period of two hours.

D. The leakage during the test shall not be more than allowed by AWWA C-600-4.

E. The required hydrostatic pressure shall be applied to the water line by means of a hand pump for small lines or by the use of a gasoline pump or fire engine for larger lines. Water shall be supplied to the line during the test period as required to maintain the test pressure as specified. The quantity used, which shall be compared to the above allowable quantity, shall be measured by pumping from a calibrated container. A 5/8-inch meter installed on the discharge side of the pump may be used to measure the leakage for large mains when approved by the Engineer.

F. During the test the lines shall be thoroughly examined for leakage at the joints and fixed where applicable.

G. Any cracked or defective pipes, fittings, or valves discovered in consequence of the pressure test shall be removed and replaced by the Contractor at his own expense. Then the force main is to be retested to the required pressure for two hours.

H. Where leakage exceeds the allowable limit, as specified herein, the defective pipe or joints shall be located and repaired. If the defective portions cannot be located, the Contractor shall remove and reconstruct as much of the work as necessary in order to conform to the specified limits. No additional payment will be made for the correction of defective work, or to damage to other parts of the work resulting from such corrective work.

I. In the event that the pipeline is tested in sections and temporary thrust blocking is required, a temporary plug or cap shall be installed and blocked with a screw jack, firmly braced against the end of the trench or against a heavy timber embedded into the sides of the trench.

J. Where pipeline construction ties into existing lines, and where it is not practicable to make a 2 hour hydrostatic pressure test, the Contractor shall leave this section of pipeline uncovered at each applicable joint for inspection for a period of 48 hours after the connection has been made and the line is placed in service. The Contractor shall make the necessary restraints to make sure that the force main does not blow apart at these uncovered joints. Any leakage discovered in these joints shall be immediately corrected by the Contractor.

K. All pressure tests must be witnessed for the two hour duration by the Engineer's inspector. The Contractor is to notify the Inspector a minimum of 24 hours prior to the pressure test.

L. All pressure tests must be witnessed for the two hour duration by the Engineer and/or a qualified Inspector. The Contractor is to notify the Engineer a minimum of 24 hours prior to the pressure test.

LEAKAGE ALLOWANCE TABLE IN U.S. GALLONS
PER 1000 FEET (FOR 50 JOINTS) PER TWO HOURS
(For a 150 psi pressure test)

Pipe Diameter	2"	3"	4"	6"	8"	10"	12"	
Leakage Allowable (DIP)		0.37	0.55	0.74	1.10	1.47	1.84	2.21
Leakage Allowable (PVC)	0.33	0.50	0.66	0.99	1.32	1.66	1.99	

Any other leakage allowance can be obtained by the following formulas:

Ductile Iron:

$L = [SD(P)^{1/2}] \div 133{,}200$

L = allowable leakage (gals./hr)

S = length of the pipeline tested (feet)

D = diameter of pipe (inches)

P = average test pressure (psig)

PVC:

$L = [ND(P)^{1/2}] \div 7{,}400$

L = allowable leakage (gals./hr)

N = # of joints in pipeline being tested

D = diameter of pipe (inches)

P = average test pressure (psig)

3.19 CLEANUP AND MAINTENANCE

A. Cleanup shall follow immediately behind the pipe laying and backfilling operations. Pipe lines and the construction site shall be kept clean and serviceable until final inspection and acceptance by the Owner.

3.20 FIELD QUALITY CONTROL

A. Field inspection will be performed by the Engineer.

3.21 PROTECTION

A. Protect pipe from damage or displacement until backfilling is in progress.

END OF SECTION

SECTION 02650

HORIZONTAL SELF-PRIMING CENTRIFUGAL PUMPS

PART 1 - GENERAL

1.01 PERFORMANCE CRITERIA

A. The pump manufacturer must be ISO 9001:2008 revision certified, with scope of registration including design control and service after sales activities.

B. The pump manufacturer must be registered to the ISO 14001 Environmental Management System standard and as such is committed to minimizing the impact of its activities on the environment and promoting environmental sustainability by the use of best management practices, technological advances, promoting environmental awareness and continual improvement.

C. Pumps must be designed to handle raw, unscreened, domestic sanitary sewage. Pumps shall have 10" suction connection, and 10" discharge connection. Each pump shall be selected to perform under following operating conditions:

1.	Pump model	Gorman-Rupp model T10A71S-B
2.	Capacity (GPM)	3,000
3.	Total Dynamic Head (FT)	65.0'
4.	Total Dynamic Suction Lift (FT)	19.08'
5.	Maximum Repriming Lift (FT)	16.5'
6.	Minimum TDH (FT)	45.0'
7.	Maximum TDH (FT)	72.0'
8.	Maximum Static Suction Lift (FT)	16.26'
9.	Total Discharge Static Head (FT)	13.70'
10.	Minimum Submergence Depth (FT)	2.0'

D. Pumps and VFD Controls shall be coordinated to ensure compatibility between the two.

E. Pump Performance Certifications

1. Solids Handling Capability

a. All internal passages, impeller vanes, and recirculation ports shall pass a 3" spherical solid. Smaller internal passages that create a maintenance nuisance or interfere with priming and pump performance shall not be permitted. Upon request from the engineer, manufacturer's certified drawings showing size and location of the recirculation port(s) shall be submitted for approval.

F. Reprime Performance

1. Consideration shall be given to the sanitary sewage service anticipated, in which debris is expected to lodge between the suction check valve and its seat, resulting in the loss of the pump suction leg, and siphoning of liquid from the pump casing to the approximate center line of the impeller. Such occurrence shall be considered normal, and the pump must be capable of automatic, unattended operation with an air release line installed.

2. During unattended operation, the pump shall retain adequate liquid in the casing to insure automatic repriming while operating at its rated speed in a completely open system. The need for a suction check valve or external priming device shall not be required.

3. Pump must reprime 16 vertical ft. at the specified speed and impeller diameter. Reprime lift is defined as the static height of the pump suction above the liquid, while operating with only one-half of the liquid remaining in the pump casing. The pump must reprime and deliver full capacity within five minutes after the pump is energized in the reprime condition. Reprime performance must be confirmed with the following test set-up:

   a. A check valve to be installed downstream from the pump discharge flange. The check valve size shall be equal (or greater than) the pump discharge diameter.

   b. A length of air release pipe shall be installed between pump and the discharge check valve. This line shall be open to atmosphere at all times duplicating the air displacement rate anticipated at a typical pump station fitted with an air release valve.

   c. The pump suction check valve shall be removed. No restrictions in the pump or suction piping will prevent the siphon drop of the suction leg. Suction pipe configuration for reprime test shall incorporate a 2 feet minimum horizontal run, a 90° elbow and vertical run at the specified lift. Pipe size shall be equal to the pump suction diameter.

   d. Impeller clearances shall be set as recommended in the pump service manual.

   e. Repeatability of performance shall be demonstrated by testing five consecutive reprime cycles. Full pump capacity (flow) shall be achieved within five minutes during each cycle.

   f. Liquid to be used for reprime test shall be water.

   g. Upon request from the engineer, certified reprime performance test results, prepared by the manufacturer, and certified by a registered professional engineer, shall be submitted for approval prior to shipment.

G. Certified Pump Performance Test

1. Tests shall be conducted in accordance with Hydraulic Institute Standards 14.6.3.4 Acceptance Grade 2B at the specified head, capacity, rated speed and horsepower. The performance tests will validate the correct performance of the equipment at the design head, capacity and speed.

H. Manufacturer's Warranty

1. The pump manufacturer shall warrant the pump equipment to be of quality construction, free of defects in material and workmanship. A written warranty shall include specific details described below.

2. All equipment, apparatus, and parts furnished shall be warranted for sixty (60) months, excepting only those items that are normally consumed in service, such as oils, grease, packing, gaskets, O-rings, etc. The pump manufacturer shall be solely responsible for warranty of the pump equipment and all components.

3. Components failing to perform as specified by the engineer, or as represented by the manufacturer, or as proven defective in service during the warranty period, shall be replaced, repaired, or satisfactorily modified by the manufacturer.

4. It is not intended that the pump manufacturer assume liability for consequential damages or contingent liabilities arising from failure of any vendor supplied product or part which fails to properly operate, however caused. Consequential damages resulting from defects in design, or delays in delivery are also beyond the manufacturer's scope of liability.

5. This limited warranty shall be valid only when installation is made and use and maintenance is performed in accordance with manufacturer recommendations. The warranty shall become effective on the date of acceptance by the purchaser or the purchaser's authorized agent, or sixty (60) days after installation, or ninety (90) days after shipment from the factory, whichever occurs first.

PART 2 - PRODUCT

2.01 MANUFACTURER

A. The specifications and project drawings depict equipment and materials manufactured by The Gorman-Rupp Company which are deemed most suitable for the service anticipated. The contractor shall prepare his bid based on the specified equipment for purposes of determining low bid. Award of a contract shall constitute an obligation to furnish the specified equipment and materials.

B. Upon request of the Engineer, manufacturer shall provide an installation list consisting of 20 current users of manufacturer's equipment in South Carolina and 100 in the United States.

C. Pumps shall be of standard catalog design, totally warranted by the pump manufacturer.

D. Upon request of the Engineer, manufacturer must show proof of original design and testing. "Reverse engineered" products fabricated to substantially duplicate the design of the original product shall not be allowed, as they may contain substantial differences in tolerances and material applications addressed in the original design which may contribute to product failure.

E. For quality control reasons pumps shall be cast, machined, assembled, and tested in the United States.

2.02 PUMP DESIGN

A. Pumps shall be horizontal, self-priming centrifugal type, designed specifically for handling raw, unscreened, domestic sanitary sewage. Pump solids handling capability and performance criteria shall be in accordance with requirements listed under PART 1 - GENERAL of this section.

B. The pump manufacturer must be ISO 9001:2008 revision certified, with scope of registration including design control and service after sales activities.

C. Materials and Construction Features

1. Pump casing shall be cast iron Class 30 with integral volute scroll. Casing shall incorporate following features:

a. Mounting feet sized to prevent tipping or binding when pump is completely disassembled for maintenance.
b. Fill port coverplate, 3 1/2" diameter, shall be opened after loosening a hand nut/clamp bar assembly. In consideration for safety, hand nut threads must provide slow release of pressure, and the clamp bar shall be retained by detente lugs. A Teflon gasket shall prevent adhesion of the fill port cover to the casing.
c. Casing drain plug shall be at least 1 1/4" NPT to insure complete and rapid draining.
d. Liquid volume and recirculation port design shall be consistent with performance criteria listed under PART 1 - GENERAL of this section.

D. The pump must be equipped with a removable suction head and clean-out cover plate, allowing access for service and repairs without removing suction or discharge piping. The suction head shall be removable and incorporate a Victaulic connection. The suction head clean-out cover shall permit the removal and replacement of the suction flap valve. The pump shall be provided with a replaceable suction check valve assembly including a flap valve and cast iron flap valve seat.

The pump shall be fitted with replaceable front and rear wear plates. The front wear plate shall be austempered ductile iron with Brinnell hardness 400 minimum. Replacement of the front wear plate, impeller, seal, and suction check valve shall be accomplished through the removable suction head. The entire rotating assembly, which includes bearings, shaft, seal, and impeller, shall be removable as a unit, through the front or rear of the pump, without removing the pump volute or piping.

E. Each pump shall incorporate a suction flap valve that can be removed or installed through the removable clean-out cover plate opening, without disturbing the suction piping. Sole function of check valve shall be to eliminate re-priming with each cycle. Pumps requiring suction check valves to prime or re-prime will not be acceptable.
1. In consideration for safety, a pressure relief valve shall be supplied in the suction head. Relief valve shall open at 75-200 PSI.

2. Rotating assembly, which includes impeller, shaft, mechanical shaft seal, lip seals, bearings, seal plate and bearing housing, must be removable as a single unit without disturbing the pump casing or piping. Design shall incorporate following features:

a. Seal plate shall be constructed of Austempered ductile iron(ADI) and bearing housing shall be cast iron Class 30. Separate oil filled cavities, vented to atmosphere, shall be provided for shaft seal and bearings. Cavities must be cooled by the liquid pumped. Three lip seals will prevent leakage of oil. The bearing cavity shall have an oil level sight gauge and fill plug check valve. The clear sight gauge shall provide easy monitoring of the bearing cavity oil level and condition of oil without removal of the fill plug check valve. The check valve shall vent the cavity but prevent introduction of moist air to the bearings. The seal cavity shall have an oil level sight gauge and fill/vent plug. The clear sight gauge shall provide easy monitoring of the seal cavity oil level and condition of oil without removal of the fill/vent plug.
b. Double lip seal shall provide an atmospheric path providing positive protection of bearings, with capability for external drainage monitoring.
c. Impeller shall be austempered ductile iron, two-vane, semi-open, non-clog, with integral pump out vanes on the back shroud. Impeller shall thread onto the pump shaft and be secured with a lock screw and conical washer.
d. Shaft shall be AISI 4140 alloy steel unless otherwise specified by the engineer, in which case AISI 17-4 pH stainless steel shall be supplied.
e. Bearings shall be anti-friction ball type of proper size and design to withstand all radial and thrust loads expected during normal operation. Bearings shall be oil lubricated from a

dedicated reservoir. Pump designs which use the same oil to lubricate the bearings and shaft seal shall not be acceptable.

f. Shaft seal shall be cartridge oil lubricated mechanical type. The stationary and rotating seal faces shall be tungsten titanium carbide alloy. Each mating surface shall be lapped to within three light bands flatness (35 millionths of an inch), as measured by an optical flat under monochromatic light. The stationary seal seat shall be double floating by virtue of a dual O-ring design; an external O-ring secures the stationary seat to the seal plate, and an internal O-ring holds the faces in alignment during periods of mechanical or hydraulic shock (loads which cause shaft deflection, vibration, and axial/radial movement). Elastomers shall be viton; cage and spring to be stainless steel. Seal shall be oil lubricated from a dedicated reservoir. The same oil shall not lubricate both shaft seal and shaft bearings. Seal shall be warranted in accordance with requirements listed under PART 1 - GENERAL of this section.

g. Pusher bolt capability to assist in removal of rotating assembly. Pusher bolt threaded holes shall be sized to accept same hardware as used for retaining rotating assembly.

3. Adjustment of the impeller face clearance (distance between impeller and wearplate) shall be accomplished by external means.

   a. Clearance adjustment which requires movement of the shaft only, thereby adversely affecting seal working length or impeller back clearance, shall not be acceptable.

4. Suction check valve shall be molded Neoprene with integral steel and nylon reinforcement. A blow-out center shall protect pump casing from hydraulic shock or excessive pressure. Removal or installation of the check valve must be accomplished through the cleanout opening on suction head, without disturbing the suction piping. Sole function of check valve shall be to save energy by eliminating need to reprime after each pumping cycle. Pumps requiring a suction check valve to assist reprime will not be acceptable.

5. Spool flanges shall be one-piece cast iron, class 30 fitted to suction and/or discharge ports. Each spool shall have one 1-1/4" NPT and one 1/4" NPT tapped hole with pipe plugs for mounting gauges or other equipment.

2.03 SERVICEABILITY

1. The pump manufacturer shall demonstrate to the engineer's satisfaction that consideration has been given to reducing maintenance costs.

2. No special tools shall be required for replacement of any components within the pump.

2.04 PUMP BASE

1. The pump unit(s) shall be mounted on an individual, vertical v-belt base. The base shall comprise a base plate, perimeter flange, and reinforcements. Base plate shall be fabricated of steel not less than ¼" thick. Flange and reinforcements shall be designed to prevent flexing or warping under operating conditions. Base plate and/or flange shall be drilled for hardware used to secure unit base to concrete pad as shown on the contract drawings. The base shall contain provisions for lifting the complete pump unit during shipping and installation.

2. The pump shall be provided with a N.O. thermostat, which shall cause the pump to be disconnected in the event of a high pump temperature condition. A high pump temperature protection circuit shall override the level control and shut down the pump motor(s) when required to protect the pump from excessive temperature. A thermostat shall be mounted on

each pump casing. If casing temperature rises to a level sufficient to cause pump damage, the high pump temperature protection circuit shall interrupt power to the pump motor. The pump motor shall remain locked out until the pump has cooled and circuit has been manually reset. Automatic reset of this circuit is not acceptable.

3. Pump motors shall be Baldor ECP-series, 100 HP, 3 phase, 60 hertz, 460 VAC, horizontal TEFC, 1,800 RPM, NEMA design B with cast iron frame with copper windings, induction type, inverter duty with Class F insulation and 1.15 service factor for normal starting torque and low starting current characteristics, suitable for continuous service.

4. Motors shall be outfitted with shaft grounding ring.

5. The motors shall not overload at the design condition or at any head in the operating range as specified. Motors shall be tested in accordance with provisions of ANSI/IEEE Standard 112.

6. Power to pumps shall be transmitted by V-belt drive assemblies. The sheave/belt combination shall provide the speed ratio needed to achieve the specified pump operating conditions. Each drive assembly shall utilize at least two V-belts providing minimum a combined safety factor of 1.5. Single belt drives or systems with a safety factor of less than 1.5 are not acceptable. Computation of safety factors shall be based on performance data published by the drive manufacturer. Pump drives to be enclosed on all sides by a guard constructed of fabricated steel or combination of materials including expanded, perforated, or solid sheet metal. No opening to a rotating member shall exceed 1/2 inch. Guards must be completely removal without interference from any unit component, and shall be securely fastened and braced to the unit base. The guard shall be finished in accordance with Section 3, Color Definitions of ANSI 253.1; Safety Color Code for Marking Physical Hazards.

2.05 FIELD QUALITY CONTROL

Operational Test

1. Prior to acceptance by owner, an operational test of all pumps, drives, and control systems shall be conducted to determine if the installed equipment meets the purpose and intent of the specifications. Tests shall demonstrate that all equipment is electrically, mechanically, structurally, and otherwise acceptable; it is safe and in optimum working condition; and conforms to the specified operating characteristics.

2. After construction debris and foreign material has been removed from the wet well, contractor shall supply clear water volume adequate to operate station through several pumping cycles. Observe and record operation of pumps, suction and discharge gage readings, ampere draw, pump controls, and liquid level controls. Check calibration of all instrumentation equipment, test manual control devices, and automatic control systems. Be alert to any undue noise, vibration or other operational problems.

END OF SECTION

SECTION 02770

ELECTRICAL

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Power, lighting and control system.

B. Installing and connecting starting equipment and controls for pumps and pumping equipment and other specified items.

C. Feeders and branch circuits for, and electrical connections to pumping, metering, signaling and mechanical equipment.

D. Power, lighting and control system for pump station equipment.

E. Other electrical items as may be necessary to complete the work shown in the plans.

1.02 RELATED SECTIONS

A. Section 02650 - Horizontal Self-Priming Centrifugal Pumps.

B. Section 016300 - Sewage Electrical VFD Control Panel.

1.03 REFERENCES

A. National Electrical Code, latest edition

1.04 REGULATORY REQUIREMENTS

A. Conform to applicable code for materials and installation of the work of this section.

1.05 SUBMITTALS

A. Submit all product data.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. General Electric

B. Westinghouse

C. Square D

D. Substitutions: Under provisions of Section 01600.

2.02 GENERAL

A. These specifications shall apply to the materials to be furnished and installed to complete the electrical portions of the plans.

B. All electrical wires, fittings, and accessories shall be of the type and class shown on the plans or designated in these specifications or as required by applicable code.

C. All materials shall be new and shall conform to the standards of Underwriter's Laboratories, Inc. in every case where such a standard has been established for the particular type of material in question.

PART 3 INSTALLATION

3.01 CODES, PERMITS, AND INSPECTIONS

A. The Contractor shall obtain, at his own expense, all necessary permits required for the proper execution of the work covered by this section of the Specifications. Further, he shall comply with the regulations of the National Electrical Code and all local codes having jurisdiction and shall deliver to the Owner, without charge, all certificates of inspection issued by inspecting authorities. The Contractor shall familiarize himself with all local codes having jurisdiction before submitting bids.

3.02 STANDARDS FOR WORKMANSHIP

A. All work shall be executed in a workmanlike manner and shall present a neat and mechanical appearance when complete.

3.03 CHANGES AND ADDITIONAL WORK

A. No change shall be made from the work as called for by these Specifications and Drawings except on the written order of the Engineer. No charges for extra work shall be allowed unless such extra work has been authorized by a written order of the Engineer stating charge to be made for the work.

3.04 MATERIAL AND EQUIPMENT SCHEDULES

A. As soon as practical and within 30 days after the date of award of Contract, and before any purchase of material is made, the Contractor shall submit to the Engineer for approval a complete list in triplicate of materials, fixtures, and equipment to be incorporated in the work. The list shall include catalog numbers, cuts, diagrams, drawings and such other descriptive data as may be required by the Engineer. No consideration will be given to partial lists submitted from time to time.

3.05 EQUIPMENT ENCLOSURES

A. Unless specifically specified otherwise, equipment enclosures covered in paragraphs following in this Section of the Specifications pertain to equipment that is intended for use above grade and in normally dry locations. Electrical characteristics of all equipment and devices shall comply with the application provisions of other paragraphs of this section of the Specifications.

B. All equipment except as otherwise indicated shall be contained in a NEMA 1, 14-gage steel welded cabinet with fixed panel for all components, in control buildings or NEMA 3R, mounted on poles outside. Double front access doors shall have key, lock and handle. Junction and outlet boxes shall be of the cast-metal type with arrangements of the National Electrical Code.

3.06 ELECTRICAL SERVICE

A. VOLTAGE: The service voltage for the control building shall be 480 volts, 3-phase for operating four (4) 100hp pumps equipment. A transformer 15KVa shall be installed for house lighting and all 120 volt power with a separate lighting panel.

B. UTILITY COORDINATION AND CONNECTION: The Contractor is responsible for coordinating with the local utility in bringing service to all required sites. The Contractor is responsible for making all electrical connections required for the job. Metering shall be the requirements with the local utility to assure that the meter socket is located to suit and that conduit and wire are installed from the meter socket to the current transformers. Service conductors in rigid meter conduit terminating with a service mast including flashing and fitting shall be furnished and installed. Whenever possible all exterior wiring will be enclosed in underground conduit.

3.07 CONDUIT SYSTEM

A. Conduit system shall be installed in accordance with the applicable provisions of the National Electrical Code. Conduit shall be galvanized rigid steel. Exposed runs of conduit shall have supports spaced not more than 8 feet apart and shall be installed with runs parallel or perpendicular to walls or structural members with right angle turns consisting of cast metal fittings or symmetrical bends. Conduit which has been crushed or deformed in any way shall not be installed. Conduit shall be securely fastened to all metal outlet junctions and wiring troughs with galvanized locknuts and bushings. Equipment connections shall be made with flexible or rigid conduit as required, except that connections to equipment in outdoor installations shall be made with watertight plastic covered flexible conduit. All conduit shall be painted with an asphaltic paint or corrosive resistant.

3.08 CONDUCTORS

A. A complete system of conductors shall be installed in the raceway system. Branch circuit and feeder connectors within the building shall be Type THW. Branch circuit wiring shall be no smaller than Number 12 AWG. Control wiring shall be no smaller than Number 14 AWG. Conductors shall be continuous from outlet to outlet, and no splices shall be made except within outlet or junction boxes. Junction boxes may be utilized

where required.

B. Service conductors shall be Type THW installed in conduit routed and sized as shown on the Plans. Underground feeders shall be Type THW installed in plastic coated rigid conduit as shown on the Plans.

3.09 OUTLETS, COVER PLATES AND PULL BOXES

A. Outlet boxes of a type to suit the intended use shall be installed at the location shown on the Plans. In general, wall receptacles shall be 36 inches above the floor and wall switches four feet above the floor. Switch, receptacle and other wall mounted boxes shall be four inches square fitted with appropriate plastic covers or may be deep switch boxes with mounting ears designed for concrete block or tile construction. Outlets for exposed work shall be of cast steel or allow fitted with appropriate covers.

B. Cover plates for all switch and receptacle shall be oversized, satin finish, stainless steel or aluminum plates as made by Sianor, Sierra, or an approved equal.

C. Pull boxes and wiring troughs, where required for interior work, shall be constructed of code-gage galvanized sheet metal of not less than the minimum size recommended by the National Electric Code. Boxes shall have screw fastened covers. Pull or junction boxes exposed to the weather shall be watertight and shall be made of cast metal. A suitable gasket shall be installed between the box and cover and a sufficient number of cover screws shall be installed to hold the cover firmly in place along its entire contact surface. Where several circuits pass through a common pull box, the circuits shall be tagged to indicate clearly their electrical characteristics, circuit number and designation.

3.10 RECEPTACLES

A. All interior duplex convenience receptacles shall be specification grade, rate 15 amperes, 125 volts, Hubbell Number 5252, or equal, and single receptacles, Hubbell Number 521, or equal. Exterior convenience receptacles shall be weather-proof, Hubbell Number 5214, or equal.

3.11 MOTOR STARTER

A. In general, all motor starters, control for all motor operated equipment, metering equipment, and pumping equipment are to be furnished under other sections of the Specifications, but installed and wired under this section. Starter shall be equal to those manufactured by Square "D" Company only.

B. An aluminum nameplate with black background and etched natural aluminum letters shall be furnished on each starter and breaker to designate the circuit.

3.12 CONTROL AND CONTROL WIRING

A. All power and control wiring and the installation and adjustment of electrical apparatus shall be accomplished by the Electrical Subcontractor.

3.13 GROUNDING

A. The neutral conductor and equipment grounding shall be in accordance with applicable sections of the National Electrical Code.

3.14 TESTS

A. After the entire electrical system is completed, and at such time as the Engineer may direct, the contractor shall conduct an operating test for approval. The tests shall be performed in the presence of the Engineer or his authorized representative, and the equipment shall be of these Specifications. The Contractor shall furnish all equipment and personnel required for the tests.

3.15 GUARANTEE

A. The Contractor shall leave the entire electrical system installed under this contract in proper working order and shall, without additional charge, replace any work or material which develops defects, except from ordinary wear and tear, within one year from the date of the final acceptance by the Owner.

3.16 PAYMENT

A. Payment for all items included in this section shall be included in the lump sum price for "Electrical" as set forth in the Proposal.

END OF SECTION

SECTION 02780

EMERGENCY GENERATOR

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Diesel powered emergency generator in connection with well pumps, booster pump stations and sewer lift stations.

B. Auxiliary equipment.

1.02 RELATED SECTIONS

A. Section 02770 – Electrical.

1.03 REFERENCES

A. NFPA 76

B. UL-1008

1.04 REGULATORY REQUIREMENTS

A. Conform to applicable code for materials and installation of the work of this section.

1.05 SUBMITTALS

A. Submit all data for the diesel powered generator and auxiliary equipment.

B. Submit foundation plan design.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Substitutions: In accordance with Section 01631.

2.02 GENERAL

A. These specifications shall apply to the materials to be furnished and installed to complete the emergency generator installation in accordance with the plans.

B. All equipment and auxiliaries shall be of the class and type as indicated on the plans or as designated here within.

C. The equipment specified herein and all required auxiliary equipment, fittings, shall be furnished to make a complete installation.

2.03 EMERGENCY GENERATOR

A. The standby electric power system shall include an electric generating set rated for standby service at Chestnut Road Pump Station. The complete, operable standby system; factory tested ready for installation, shall be a package of new and current equipment by Caterpillar or approved equal, consisting of the following:

1. Engine driven electric generating set to provide standby power.

2. An engine-generator control console mounted on the generating set shall include complete engine start-stop control and monitoring systems. Controller to be equipped with vibration isolation pads.

3. An automatic transfer switch to initiate automatic starting and stopping of the engine and switching of the load.

4. Mounted accessories and other equipment as specified.

5. Generator shall run 24 hours.

B. The system shall be built, tested and shipped by a manufacturer, who has been regularly engaged in the production of the engine-generator sets and associated controls for a minimum of ten years, so there is one source of supply and responsibility. Local manufacturers' service and parts must be available 24 hours per day and located within 75 miles of the installation. Surrogate service is unacceptable.

C. The manufacturer shall furnish schematic and wiring diagrams for the engine-generator set, automatic transfer switch and an interconnecting diagram shown connection to individual components which constitute the standby power system. Performance tests of the generating set series shall be certified by an independent testing laboratory.

D. The complete standby electric power system shall be warranted for a period of five years from start-up or 2500 operating hours, whichever occurs first. In addition to the manufacturer's warranty, the local service representative shall have in operation, and for a period of two years from start-up, schedule a preventive maintenance inspection to be performed quarterly at no charge to the owner and must be signed off in a permanent log to be supplied by the representative and maintained on the engine-generator equipment at all times. Included in the inspection will be a review of all operating and maintenance requirements with the owner.

E. The approved bidders shall furnish with their bids the following information along with certification as to approval.

1. Make of engine
2. Number of cylinders
3. Bore, inches
4. Stroke, inches
5. Piston displacements, cubic inches
6. Piston speed, feet per minute at rated RPM
7. BMEP at rated KW output
8. Make and type of generator

9. Generator electrical rating, KVA
10. Number of type of bearings (generator)
11. Exciter type
12. State if turbo-charged and after-cooled or both
13. H.P. Continuous
14. H.P. Standby
15. Maximum SKVA available
16. Temperature rise at full load
17. Charger

F. Exceptions to these specifications may be considered sufficient cause for rejection of bids.

2.04 DIESEL ENGINE

A. Type: The engine shall be a compression ignition engine of Domestic Manufacture only. No foreign engines allowed. It shall be a 60 cycle solid-injection engine of either vertical in-line or V-type provided sufficient continuous/standby and continuous H.P. is developed as called for herein.

B. Horsepower rating shall be rated continuous. Engine manufacturer's published curves both standby and continuous shall be submitted. Set shall be capable of continuous operation for a minimum of 30 days without damage at the standby rating. Continuous rating shall be capable of 10% overload for 2 hours of any 24 and shall be the same at the standard continuous industrial engine rating. Special ratings will not be allowed. All ratings shall be substantiated by factory published curves. Engine BHP shall be 1.5 x rate KW. Maximum BMEP shall not exceed 174 PSI.

C. Speed: The engine speed shall not exceed 1800 RPM normal full load operation. Use of speed reducers/increasers, gear drives and belts are prohibited.

D. Fuel: The engine shall be capable of satisfactory performance on a commercial grade of distilled petroleum fuel oil such as No. 2 fuel oil.

E. Isochronous Governor: The engine speed shall be governed by an (electric, hydraulic) governor to maintain governed speed at precise isochronous control for 60 cycle operation. The frequency at any constant load, including no load, shall remain within a steady state band width of plus or minus (.25% - 3%) of rated frequency. The governor shall not permit frequency modulation (defined as the number of times per second that the frequency varies from the average frequency in cyclic manner) to exceed 60 cycle per second. Governor and controller shall be equipped with single phase load pulse option for quicker response.

F. Fuel System: The fuel system shall be that which is normally used by the diesel engine manufacturer. It shall include a replaceable element fuel filter conveniently located for servicing. The fuel tank shall have a capacity sufficient to permit the engine to run for twenty-four (24) hours at full rated load without refueling. The fuel tank must be labeled as to contents. The fuel tank must be a double walled tank or have a suitable fuel containment system built around the storage tank. A fuel containment system must be designed to contain the entire volume of the fuel tank plus seven inches of rainwater volume over the entire containment system area. Fuel lines will be double walled. It shall be contained in a rupture basin with 110% capacity. The tank shall meet UL142

standards. A locking fill cap, a mechanical reading fuel level gauge, low fuel level alarm contact, and fuel tank rupture alarm contact shall be provided.

5 Gallon Fuel Fill spill containment (without exception)

G. Oil Pump and Cleaners: The engine shall have a gear-type lubricating oil pump for supplying oil under pressure to main bearings, crank-pin bearings, piston pins, timing gears, camshaft bearings and valve rocker mechanism.

Full flow filters, conveniently located for servicing, shall be provided. Filters shall be equipped with a spring bypass valve to insure oil circulation if filters are clogged.

H. Cylinder Liners: The engine shall be provided with removable wet or dry type cylinder liners of close-grained alloy iron.

I. Air Cleaners: The engine shall be provided with one or more dry type air cleaners, as recommended by the engine manufacturer.

J. Starting: The engine shall be equipped with a (12, 24) volt electric starting system with sufficient capacity to provide cranking of the engine at a speed which will allow diesel starting of the engine.

1. Batteries: (Lead Acid, Calcium, Nicad) Battery. Batteries shall be rack mounted with the appropriate number of cells for engine manufacturer system voltage.

   Capacity shall be for at least 3 cranking cycle (each cycle consisting of 3 each 10-second cranks with 5-second rest at 60 degrees F.

2. Battery Charging: An automatic "float" type battery charger shall be provided to maintain the batteries at normal capacity and to recharge batteries after cranking. The charger shall be 120 volts input with (12, 24) volt output. It shall include AC compensation, current limit, DC ammeter, volt-meter to show battery voltage, equalizing switch, fused AC input and DC output, complete isolation of AC input and DC output and be designed as not to discharge battery in a maximum of 8 hours. The charger shall bear Underwriters Lab Label. Charger shall be on circuit fed by emergency system.

K. Engine Instruments: The engine mounted instrument panel shall contain the following gauges for proper engine surveillance and maintenance:

1. Engine Water Temperature
2. Engine Lube Oil Pressure
3. Engine Running Hourmeter
4. Engine Lube Oil Temp. (outside units only)

L. Cooling: Cooling shall be by means of a skid mounted radiator. The engine shall be furnished with a cooling system having sufficient capacity for cooling the engine when the diesel generator set is delivering full-rated load at the ambient temperature and sized for a minimum of 110 degrees F. ambient regardless of stated ambient.

The engine shall be equipped with an engine driven, water circulating pump if required and thermostatic valve to maintain the engine at a recommended temperature level.

System shall be filled with a suitable coolant. Heat rejection data on the engine and cooling capacity of the standpipe shall be submitted showing calculations and capacities.

The engine generator shall be supplied with a block heater capable of keeping the engine at operating temperature during cold weather to insure quick starting. The heater shall be 120 volts and sized to match engine displacement.

M. Exhaust System: A super critical grade silencer, companion flanges, and flexible stainless steel exhaust fitting properly sized shall be furnished and installed inside enclosure (no exception). The silencer shall be mounted so that its weight is not supported by the engine nor will exhaust system growth due to thermal expansion be imposed on the engine. Exhaust pipe size shall be sufficient to ensure that exhaust backpressure does not exceed the maximum limitations specified by the engine manufacturer.

N. Safety Controls: The engine shall be equipped with automotive safety controls which will shut down the engine in the event of low oil pressure, overcrank, high water temperature and engine overspeed and make electrical contacts for alarm lights on the control panel.

O. Mounting: The engine and generator shall be equipped with suitable sub-base for mounting the engine-generator unit on a concrete foundation or a suitable steel base.

The engine shall be equipped with spring type vibration isolators between the sub-base and the concrete foundation. Isolators shall have adjustable snubbers.

The complete assembly shall be suitable for outdoor mounting complete with epoxy painted steel weather proof or fiberglass weatherproof housing complete with required louvers. All hardware shall be stainless steel and housings are to be equipped with locks and roof mounted exhaust systems.

2.05 ALTERNATOR

A. Rating: The generator shall be a 480 volt, 3 phase, 4 wire, rate 400 KW by resistance over an ambient of 40 degrees C, continuous duty.

B. Construction and Manufacture: The generator shall be a salient pole synchronous alternator, continuous rated, 0.8 P.F., 120 KVA. The unit shall be the single bearing type with disc type coupling rigidly bolted to the generator shaft. The generator rotating speed shall not exceed 1800 revolutions per minute as specified.

C. Rotating Exciter: The generator shall be of brushless construction using a full wave three phase rotating rectifier assembly with hermetically sealed, metallic type silicon diodes to supply main field excitation. The rotating exciter shall be mounted outboard of the generator bearing to allow removal of all or any part of the exciter without disassembly of the generator. It shall be possible to check the rotating diodes without breaking any solder connection. A multi-plate selenium surge protector shall be connected across the rotating diode network to protect it against transient conditions.

The exciter shall be capable of maintaining 300% short circuit current on the alternator and provide full exciter power regardless of alternator voltage for motor starting and sustaining voltage for sufficient time for protective devices to operate.

The generator-exciter regulator package shall provide a voltage regulation of plus or minus 1% of rated voltage. Voltage regulation shall apply to any load from no load to rated load at rated power factor. The regulator system shall include a power isolation transformer, under frequency protection and auto-manual controls.

Stator insulation shall be Class "F", epoxy-vacuum impregnated, rated for 30 degrees C rise by resistance above a 40 degree C ambient, continuous duty.

With the generator operating at rated speed, rated voltage, noload, the sudden application of rated load, rated power factor shall not cause a transient voltage deviation of more than 18% from rated voltage.

Armortisseur windings with the end plates connected between poles shall be included for minimizing harmonic content, good transient performance.

The generator shall be equipped with an adequately sized conduit box for making external connections.

2.06 CONTROL EQUIPMENT AND ACCESSORIES

A. The engine generator instrument panel shall be wired, tested and shock mounted on the generating set. It shall contain but not be limited to the following: Panel lights, manual reset field circuit breaker, frequency meter, running time meter, voltage adjusting rheostat, 3 ½ - 2% accuracy AC voltmeter and ammeter, meter switch, voltmeter-ammeter selection with off position, oil pressure gauge, coolant temperature gauge if applicable, and battery charging rate ammeter, 4 position selector switch; Off, Auto, Test, Hand-crank, and the following safety shut-downs: high engine temperature, overcrank, low oil pressure, low coolant level and overspeed with signal lights and alarm terminal shall be provided. Optional wall mounted or free standing cabinet acceptable.

1. A 4 pole, 225 amp line circuit breaker shall be mounted in alternator outlet box or NEMA I enclosure. Field circuit breaker will not be considered as line C.B.

B. Automatic Controls

1. Automatic Start-Stop System: The engine starting panel shall automatically provide four cranking and three rest periods, and shall also be energized if the engine has not started by the end of the fourth cranking cycle. In addition, an audible alarm, energized by the automatic starting panel or safety controls shall be provided. Operation shall be initiated by the closing of contacts in the automatic transfer switch. The automatic starting panel control switch shall include the positions of "Automatic", "Off", and "Manual". The automatic starting panel shall contain 120 volt alarm lights energized by the safety controls noted.

C. Remote Annunciator: The generator system shall include a 9 indicator remote annunciator panel complying with NFPA bulletin #76 for audible and visual signals and shall be located as shown on the drawings. Engine shall be equipped with pre-alarms for all conditions required under NFPA 76.

2.07 AUTOMATIC TRANSFER SWITCH (Must be supplied in the generator package to insure proper coordination and one source of responsibility.)

A. Rating: The automatic transfer switch shall be furnished as shown on the drawings with full load current rating of 600 amperes at 480 volts, 3 phase, 4 wire, and 60 hertz. The transfer switch shall be capable of switching all classes of load and shall be rated for continuous duty when installed in a non-ventilated enclosure constructed in accordance with Underwriters Laboratories, Inc. Standard UL-508.

B. Construction and Performance: The transfer switch shall be double throw, actuated by a single electrical operator momentarily energized. The transfer switch shall be capable of transferring successfully in either direction with 70% or rated voltage applied to the switch terminals. Transfer switch shall have a set of dry contacts for remote annunciation of transfer.

The normal and emergency load contacts shall be positively interlocked mechanically and electrically to prevent simultaneous closing.

The transfer switch shall be equipped with a manual operator that is designed to prevent injury to the operating personnel if the electrical operator should suddenly become energized during manual transfer. The manual operator shall provide the same contact transfer speed as the electrical operator to prevent a flashover from switching the main contacts slowly. A manual operator designed only for maintenance purposes and not capable of full load, energized operation will not be allowed.

C. Sequence of Operation: Engine starting contact shall be provided to start the generating plant if any phase of the normal source drops below 70% of rated voltage after a non-adjustable time delay period of 3 seconds, to allow for momentary dips. Voltage monitoring of all three phases is required. The transfer switch shall transfer to emergency as soon as the voltage and frequency have reached 90% of rated. After restoration of normal power on all phases to 90% of rated voltage, an adjustable time delay retransfer to normal power until it has had time to stabilize. If the emergency power sources shall fail during the time delay period, the time delay shall be by-passed, and the switch has retransferred to normal, the engine-generator shall be allowed to operate at no load for an adjustable period of time (0-5 minutes) to allow it to cool before shutdown. The transfer switch lights on the cabinet door to indicate the switch closed on normal or emergency and four auxiliary contacts on the main shaft; two closed on normal, two closed on emergency. In addition, one set of relay contacts shall be provided to open upon loss of the normal power supply. All relays, timers, control wiring and accessories to be front accessible. The automatic transfer switch shall contain an automatic exerciser 15 minutes once every 168 hours under load.

For proper system coordination, the manufacturer of the automatic transfer switch shall verify that his switch is listed by Underwriters Laboratories, Inc., in his submittal, under UL-1008 with a withstand and closing rating at least equal to the interrupting rating of the circuit breaker specified by the engineer to protect the circuit. Available fault current is 600 amps RMS symmetrical.

PART 3 INSTALLATION

3.01 GENERAL

A. The Contractor shall furnish all material and labor, and construct the emergency generator shown on the plans, including all foundations, enclosures, mounting hardware, electrical wiring, locks, fuel tanks, and other auxiliary equipment that may be required to furnish a complete installation.

B. The Contractor shall be responsible for clearing all debris, rubbish, tools and equipment from the site and restoring the site to a neat and orderly appearance.

3.02 FOUNDATION

A. The foundation shall be of reinforced concrete and of dimensions suitable for the equipment to be installed thereupon.

B. Anchor bolts shall be of a type approved by the equipment manufacturer(s) and shall be stainless steel.

C. The top of the foundation shall be at least three inches above the surrounding earth to prevent water from entering the equipment area.

D. Suitable openings shall be placed in the foundation for all electrical wiring which must pass through it. Electrical wiring to the facility being serviced shall pass through conduit meeting standards of the National Electric Code, latest edition.

3.03 TESTING

A. Before the equipment is installed, a dealer certified test log of the generator set showing a minimum of 4 hours testing with 2 hours of 100 percent rated load, continuously, shall be submitted to the A.E. Normal preliminary engine and generator tests shall have been performed before unit assembly and shall include transfer switch and simulated loss of power.

Prior to acceptance of the installation, the equipment shall be subjected to a full load test. Contractor shall provide load banks and operator for this test if building load is insufficient or unavailable.

END OF SECTION

SECTION 02790

BUILDING CONSTRUCTION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Building construction Water Booster pump station.

1.02 RELATED SECTIONS

A. Section 02791 - Roofing Underlayment, High-Temperature.

B. Section 03250 - Concrete.

1.03 REFERENCES

A. ALSC - American Lumber Standards Committee: Softwood Lumber Standards.

B. APA - American Plywood Association.

C. AWPA - American Wood Preservers' Association: Book of Standards.

D. FS - TT-W-571 - Wood Preservation: Treating Practices.

E. NFPA - National Forest Products Association.

F. SFPA - Southern Forest Products Association.

G. ANSI/ASTM B209 - Aluminum and Aluminum-Alloy Sheet and Plate.

H. ANSI/ASTM D226 - Asphalt-Saturated Organic Felt Used in Roofing and Waterproofing.

I. ANSI/ASTM B221 - Aluminum-Alloy Extruded Bar, Rod, Wire, Shape, and Tube.

J. ANSI/ASTM E283 - Rate of Air Leakage through Exterior Windows, Curtain Walls, and Doors.

K. ANSI/ASTM E330 - Structural Performance of Exterior Windows, Curtain Walls, and Doors by Uniform Static Air Pressure Difference.

L. ASTM B209 - Aluminum and Aluminum Alloy Sheet and Plate.

M. FS JTT-P-31 - Paint, Oil: Iron-oxide, Ready Mixed, Red and Brown.

N. FS TT-P-645 - Primer, Paint, Zinc Chromate, Alkyd Type.

1.04 REGULATORY REQUIREMENTS

A. Conform to applicable code for materials and installation of the work of this section.

1.05 SUBMITTALS

A. Submit all product data.

B. Submit product data for doors, paints, coatings and roofing materials.

PART 2 PRODUCTS

2.01 GENERAL

A. These specifications shall apply to the materials to be furnished and installed to complete the building construction in accordance with the plans.

B. All materials shall be of the class and type as indicated on the plans or as specified here within.

2.02 MASONRY MATERIALS

A. Mortar Materials

1. Portland Cement shall conform to A.S.T.M. Spec. C-150, Type 1, latest edition.

2. Hydrated Lime shall meet A.S.T.M. Spec. C-207, Type S, latest edition.

3. Sand shall be clean, sharp and well graded from coarse to fine.

4. Masonry cement may be a standard package product acceptable to the Engineer and shall conform to A.S.T.M. Spec. C-91, Type II.

5. Water for all work shall be free of organic material, strong acids, or alkalis.

B. Steel Reinforcing

1. Steel bars for core and lintel reinforcing shall conform to A.S.T.M. Spec. A-15.

2. Masonry wall reinforcing shall be truss design, galvanized, standard weight, DUR-O-WALL conforming to A.S.T.M. Spec. A-153, Class B-2.

2.03 DOORS

A. Entrance Doors and Frames

1. Exterior entrance doors shall be 3.0 Bi-hinge Therma-Tru Model (FC100) out swing type door. Doors shall be placed in metal frames. Doors shall be painted the color selected by the owner.

2. All door hardware to be stainless steel.

2.04 SUBMITTALS

A. Submit shop drawings and product data.

B. Include wall opening and component dimensions; wall opening tolerances required; anchorage and fasteners; affected related work; installation requirements.

C. Submit manufacturer's installation instructions.

2.05 WOOD FRAME AND ROOF

A. Framing and Sheathing

1. Lumber Materials: All Joists, Rafters, Girders, Trusses, Beams, Studs, and other Structural Wood Members shall be No. 2 kiln-dried Southern Yellow Pine Treated Lumber or Better (Fb = 1300 psi, FT = 675 psi, Fc = 1200 psi).

2. Plywood Materials: Roof Sheathing - APS Structural I, Grade CC-EXT-APA; unsanded. 5/8" Thick, attached with 8d Galvanized nails 4" o.c.

3. Accessories: Fasteners - Hot dipped galvanized steel for exterior, high humidity, and treated wood locations; plain finish elsewhere; size and type to suit condition.

4. Wood Treatment: Wood Preservative (Pressure Treatment) - FS TT-W-571 AWPA Treatment C@ using waterborne preservative with 0.30 percent retainage.

Wood Preservative (Surface Application): Clear type.

B. Roofing Materials

1. Steel Roofing: 29 gauge metal roofing; 40 year limiting paint warranty; Light Gray.

2. Underlayment: See Section 02791.

3. Fasteners: Manufacturer standard #12 by 1 ¼ inch long self-drilling, hex head drive screws for metal non-corrosive base material color to match roof color.

4. Plastic Cement: ANSI/ASTM D2822; asphaltic type with mineral components.

C. Flashing Materials

1. Sheet Flashings (Drip Edge): ANSI/ASTM B209; 0.03 inch thick aluminum.

2. Nails: Standard round wire roofing type of hot-dipped zinc-coated steel; minimum 19/64 inch head diameter and 0.104 inch shank diameter; of sufficient length to penetrate through roof sheathing.

PART 3 INSTALLATION

3.01 GENERAL

A. The Contractor shall furnish all material and labor, and construct the buildings shown on the plans, including all clearing, grubbing, excavating, sheathing, backfilling, and other appurtenances, as shown on the plans.

B. The Contractor shall be responsible for the cleaning away of all rubbish, surplus materials, and the furnishing of all materials, tools, implements, and labor required to build and put in complete working order the buildings and appurtenances as shown on the plans and specified.

C. All OSHA requirements pertinent to these buildings shall be followed.

3.02 MASONRY

A. Delivery, Storage, and Handling

1. All materials shall be so delivered, stored, and handled so as to prevent the inclusion of foreign materials and the damage of materials by water or breakage.

2. Package materials shall be delivered and stored in original packages until ready for use. Packages or materials showing evidence of water or other damage will be rejected. All materials shall be of the respective qualities specified herein.

3. Masonry units shall be handled in a manner to prevent undue chipping and breakage. Locate storage piles to avoid or be protected from heavy traffic. Pile units neatly on pallets to protect them from soil. Exercise special care to avoid soiling or staining of facing units. Any unit that becomes cracked during handling or placing will be rejected.

B. Laying, Setting, Workmanship

1. Mortars For All Masonry Work

a. Mixing: Lime cement mortars shall be measured by volume, sand and cement mixed dry, lime putty added and then water added to bring to proper consistency for use.

Mixing of packaged cement mortars shall be in strict accord with manufacturer's directions. All mixing boxes, boards, and equipment shall be kept clean.

Mortar shall not be retempered and no mortars that have stood for more than one (1) hour shall be used.

b. Proportions and Mixes: Lime cement mortars shall be 1 part Portland Cement, one-half lime putting and not more than 3 parts sand.
Masonry cement mortars shall be 1 part masonry cement, ½ part Portland Cement and 3 parts sand.

All shall conform to A.S.T.M. C-270, Type S.

2. Workmanship

All work shall be laid plumb, level, and true and shall conform to the dimensions shown on the Drawings. All work shall be laid to a line. The work shall be properly conducted, keeping the tools, mortar boards, and other equipment in good order and free from unnecessary accumulation of mortar.

The work shall be maintained level all around building as far as practicable, but where necessary to run up part of the work in advance of the remainder, the courses shall be racked back; toothing will not be permitted.

Build-in anchorage portions of door frames and all items as required. Set all items plumb and true and in accord with the manufacturer's directions, shop drawings or details shown on drawings.

Wooden door frames shall have anchorage portions built into masonry and the space between door frames and masonry shall be trimmed-in.. Maintain 1/4" space between frames and masonry and rake out to ½" depth to allow for sealant.

Cutting of masonry units where necessary for electric outlet boxes, vent pipes, shall be done with a carborundum saw in a neat, workmanlike manner.

All vertical dimensions of masonry walls shall be accurately laid off on wood storey pole and the coursing and width of horizontal joints shall be carefully adjusted to produce joints of uniform width and exact vertical dimensions as shown on the Drawings. Obtain approval of the Engineer before commencing to lay up any masonry walls.

Masonry bond shall be laid out dry on the foundation wall and adjusted before starting work. All vertical joints shall be in alignment and plumb. Horizontal joints shall be level and shall line up throughout the building.

3. Sample Wall

Before laying any wall construction, the Contractor shall guild a sample wall 4' wide by 2' high. Obtain approval of sample wall form Engineer prior to working on any building wall.

4. Exterior Finish

a. Exterior Finish and Insulation System:
   1) STO INDUSTRIES, INC.

   2) DRIVIT

b. Environmental Requirements
   1) Do not install finish when ambient temperature is below 40 degrees F.

2) Maintain this temperature during and 24 hours after installation of finish.

c. Materials

1) Manufacturers: Materials are specified by brand names to establish a standard quality, or by performance requirements and general description of product. The architect will consider substitutions for brand names of products specified, provided the procedures set forth for substitutions are followed. The architect reserves the right to reject any material which, in his opinion, will not produce the quality of work specified herein.

d. Surface Preparation

1) STO PLEX W-A water-based surface sealer and adhesion intermediary, as manufactured by STO Industries, Inc.

e. Primary Fastener (Adhesive)

1) STO DISPERSION ADHESIVE - A noncementious, ready-mixed, 100% acrylic copolymer emulsion based adhesive that is waterproof and vapor permeable, as manufactured by STO Industries, Inc.

f. Insulation Board

1) Expanded Polystyrene (EPS Board) less than 25 flame spread, 1.0 lb./per cu. ft. average density; u=0.26 per inch; ASTM C578-85 Class A.

2) Dimensional tolerances shall be as follows:

a) Edges shall be square within 1/16" over the entire length of the board.

b) Thickness shall be plus or minus 1/16".

3) Thickness shall be 1-1/2 inches.

4) EPS Board shall be aged by air drying for a minimum of six weeks or equivalent kiln dried.

5) Maximum size of EPS Boards shall not exceed 2' x 4'.

6) EPS Board shall exhibit proper bead fusion and structural strength, according to STO board specifications.

7) Board must be manufactured and packaged by a STO approved and licensed EPS molder. Each board must be marked on its end

with a STO identification mark and packaged with proper identification information.

g. Secondary Fastener (Dowel)

1) STO Universal Dowel--A plastic plate fastener with a thermal cap to prevent uneven thermal and vapor diffusion. Manufactured by STO Industries, Inc.

h. Ground Coat - STO RFP

1) STO RFP: A ready-mixed, noncementious, 100% acrylic copolymer emulsion-based ground coat that is water resistant, vapor permeable, glass fiber reinforced and has noncapillary action. The STO RFP shall be tinted to the same shade as the finish.

2) STO BTS--B: A polymer-based ground coat and leveler when mixed with 7-9 quarts of clean water per each 60 lb. bag of STO BTS--B, STO PRIMER must be applied as an adhesion intermediary, providing water resistance, and uniform absorption and color, as well as to eliminate the danger of efflorescence due to the cement content of STO BTS--B.

i. Fabric

1) Fabric shall be STO REINFORCING FIBER MESH with symmetrical, interlaced glass fiber made from twisted multi-end strands and coating to be alkaline resistant, at least 20 grams per square yard, for compatibility with STO Materials. The mesh shall be shift-proof, with trimmed roll edges to minimize building on overlapped seams.

j. Finish

1) The finish shall be exterior, ready-mixed, acrylic-based wall coatings, as manufactured by STO Industries, Inc. Texture; STOLIT 1, color selected from Manufacturer's standard colors.

k. Examination

1) Verify that substrate and adjacent materials are dry.

2) Verify substrate surface is flat, free of fins and irregularities.

l. Installation - Insulation

1) Install insulation in accordance with manufacturer's instructions.

2) Place boards in a method to maximize tight joints. Stagger

vertical joints. Butt edges and ends tight to adjacent board and to protrusions.

3) Secure boards to substrate and mechanical attachment to achieve a continuous flush insulation surface.

m. Installation - Coating

1) Install primer/adhesive, coating and reinforcement in accordance with manufacturer's instructions.

n. Performance Requirements

1) The Exterior Finish and Insulation System shall withstand 100 MPH wind loads.

o. Submittals

1) Submit under provisions of Section 0550.

2) Shop Drawings: Indicate soffit joint pattern and joint details.

3) Product Data: Provide data on system materials, product characteristics, performance criteria, and limitations.

4) Samples: Submit two (20, 12x12 inch size samples illustrating coating color and texture range for selection.

5) Manufacturer's installation instructions: Indicate preparation required, installation techniques, and jointing requirements.

p. Qualifications

1) Applicator: Company specializing in performing the work of this Section with minimum 5 years documented experience and approved by manufacturer.

3.03 DOORS

A. Exterior Doors

Therma-Tru doors and metal frames shall be installed in accordance with the plans and the manufacturer's recommendations. All appropriate stainless steel hardware shall be installed in accordance with the manufacturer's recommendations. The doors and frames shall be painted as shown on the plans or to the Owner's requirements.

3.04 WOOD FRAME AND ROOF

A. Site Applied Wood Treatment

Apply preservative treatment in accordance with manufacturer's instructions. Treat site-

sawn ends. Allow preservative to cure prior to erecting members.

B. Framing

Erect wood framing members level and plumb. Place horizontal members laid flat, crown-side up. Construct framing members full length without splices.

C. Sheathing

Secure roof sheathing perpendicular to framing members with ends staggered. Secure sheet edges over firm bearing. Provide solid edge blocking between sheets.

D. Tolerances

Framing Members: 1/4 inch maximum from true position.

E. Flashing Fabrication

1. From flashings (Drip Edge) protect roof assembly and shed water. Form sections square, true, and accurate to profile, in maximum possible lengths, free from distortion and other defects detrimental to appearance or performance.

2. Hem exposed edges of flashings minimum 1/4 inch on underside.

3. Apply bituminous paint on concealed surfaces of flashings.

F. Roof Installation - General

1. Install metal roofing over dry surfaces, free of ridges, warps, and voids.

2. Coordinate installation of roof mounted components or work projecting through roof. Verify roof openings are framed, sized, and located prior to installing work, of this Section.

3. Completed installation to provide weathertight services.

G. Eave Protection Installation

1. Place eave edge flashing tight with facing boards. Weather lap joints 2 inches and seal with plastic cement.

2. Apply lap cement at rate of approximately 1- 1/4 gal/square on underlayment starter strip.

3. Starting from eave edge of starter strip, lay additional 36 inch wide strips of underlayment in lap cement, to produce a two ply membrane. Weatherlap minimum 19 inches and nail in place. Lap ends minimum 6 inches. Stagger end joints of each consecutive ply.

H. Protective Underlayment Installation

1. Place one ply of underlayment over area not protected by eave membrane, with ends and edges weatherlapped minimum 6 inches. Stagger end laps of each consecutive layer. Nail protective underlayment to hold in place.

2. Install protective underlayment perpendicular to slope of roof.

3. Weather lap underlayment minimum 4 inches over eave membrane.

4. Weather lap and seal items protecting through or mounted on roof with plastic cement.

I. Flashing Installation

1. Weather lap joints minimum 2 inches and seal weathertight with plastic cement. Secure in place with nails at 16 inches on center. Conceal fastenings.

2. Flash and seal work projecting through or mounted on roofing with plastic cement.

J. Metal Roofing Installation

1. Place metal roofing in straight pattern.

2. Install metal roofing in place in accordance with manufacturer's instructions.

3.06 PAINTING

A. Scope

1. The work includes painting and finishing all interior and exterior exposed items and surfaces throughout the building. This includes field painting of exposed bare pipes and conduits (including color coding) and of hangers, exposed steel and iron work and primed metal surfaces of equipment installed under the mechanical and electrical work.

2. The object of these specifications is to provide the material and workmanship necessary to produce complete protection to the surfaces to be painted in addition to a neat appearance. Painting will be done at such times as the Contractor and Engineer may agree upon in order that dust-free and neat work can be obtained. All painting shall be done strictly in accordance with manufacturer's instructions and shall be performed in a manner satisfactory to the Engineer. All exposed piping to be painted in accordance with AWWA Standard C204 (latest edition).

B. Transportation of Materials

All materials shall be brought to the job site in the original sealed and labeled containers of the paint manufacturer and shall be subject to inspection by the Engineer.

C. Preparation of Surfaces

1. All surfaces to be painted shall be prepared in a workmanlike manner with the

objective of obtaining a clean and dry surface. No painting shall be applied before the prepared surfaces are approved by the Engineer.

2. Metal: All ferrous metal to be primed in the shop shall have all rust, dust and scale, as well as all other foreign substances, removed by sandblasting in accordance with SSPC (Steel Structures Painting Council), surface preparation specification No. 10. Cleaned metal shall be primed or pretreated immediately after cleaning to prevent new rusting. All ferrous metals not primed in the ship shall be sandblasted in the field to SSPC No. 10 prior to application of the primer pretreatment or paint. All nonferrous metals and galvanized surfaces whether to be shop or field primed, shall be solvent cleaned prior to the application of No.l 1799 V.C. - 17 Wash prime and/or primer.

3. All concrete surfaces shall be cleaned of all dust, form oil, curing compounds and other foreign matter. Before applying paint to a concrete surface, the surface must be etched. A 15-20% muriatic acid solution is effective on most concrete surfaces. Stronger solutions of muriatic acid may be required to produce the necessary slightly granular surface required to produce the adherence of the paint to the concrete. Surfaces poured with concrete containing an admixture or hardener or which are finished with a steel trowel, may require "double etching" with a 15-20% solution or with a solution of up to full strength acid before painting. Masonry wall surfaces with large pores, such as coarse cinder block and cellular concrete materials, where designated by the Engineer, shall receive one coat of 895 Unifill, prior to the application of the paint system specified.

4. Wood: Wood surfaces shall be thoroughly cleaned and free of all foreign matter, with cracks and nail holes and other defects properly filled and smoothed. Wood trim shall be sandpapered to a fine finish and wiped clean of dust.

D. Application

1. Apply no exterior paint in damp weather, or when temperature is below 50 degrees F.

2. Furnish and lay drop cloths where necessary to protect floors and adjacent work from damage.

3. On metal surfaces, the painter shall apply each coat of paint at the rate specified by the manufacturer to achieve the minimum dry mil thickness required. If material has thickened, or must be diluted for application by spray gun the coating shall be built up to the same film thickness achieved with undiluted material. In other words, one gallon of paint as originally furnished by the manufacturer must not cover a greater square foot area when applied by spray gun than when applied unthinned by brush. Deficiencies in film thickness shall be corrected by the application of an additional coat(s) of paint. On masonry, application rates will vary according to surface texture; however, in no case shall the manufacturer's stated coverage rate be exceeded. On porous surfaces, it shall be the painter's responsibility to achieve a protective and decorative finish either by decreasing the coverage rate or by applying additional coats of paint.

4. The Contractor shall submit to the Engineer, immediately upon completion of the job, certification from the manufacturer indicating that the quantity of each coating purchased was sufficient to properly coat all surfaces. Such certification shall make references to square footage figures provided to the manufacturer by the Contractor.

5. Drying time shall be construed to mean "under normal conditions". Where conditions are other than normal because of the weather or because painting must be done in confined spaces, longer drying times will be necessary. Additional coats of paint shall not be applied, nor shall units be returned to service until paints are thoroughly dry.

6. Remove any paint spots form floors, woodwork, hardware or equipment.

7. At completion, touch-up and restore finish where damaged or defaced and leave in first-class condition.

E. Paint Type and Color Schedule

1. Schedule - Exterior Surfaces

a. Wood - Painted

1) One coat zinc chromate primer.

2) Two coats alkyd enamel, gloss.

b. Steel - Unprimed

1) One coat zinc chromate primer.

2) Two coats alkyd enamel, gloss.

c. Steel - Shop Primed

1) Touch-up with zinc chromate primer.

2) Two coats alkyd enamel, gloss.

d. Steel - Galvanized

1) One coat zinc chromate primer.

2) Two coats alkyd enamel, gloss.

2. Schedule - Interior Surfaces

a. Wood - Painted

1) One coat alkyd prime sealer.

2) Two coats alkyd enamel, gloss.

b. Concrete, Concrete Block, & Pump Room

1) One coat Hydro-Gard II by Crete Gard.

2) Two coats Alkyd Enamel Gloss.

3) In accordance with the manufacturer's Instructions to the walls and ceiling.

c. Concrete Wetwell and Access

1) Apply minimum 120 miles of Raven 405 or Spectra Shield in accordance with the manufacturer's Instructions to the walls and ceilings.

d. Steel - Unprimed

1) One coat zinc Chromate primer.

2) Two coats alkyd enamel gloss.

e. Steel - Primed

1) Touch-up with original primer.

2) Two coats alkyd enamel gloss.

f. Steel - Galvanized

1) One coat zinc chromate primer.

2) Two coats alkyd enamel gloss.

3. Schedule Colors

a. Concrete Wetwell – Grey

b. Concrete Block Pump Room - White

c. All Piping and Fittings in Pump Room - White

d. Pump Frames - White

e. Pumps - White

f. Motors - Do Not Paint

g. Belt Guards - Orange

h. Doors and Frame - Dark Brown

i. Outside Trim - White

j. Exterior Building - White

k. Interior Wood - White

4. Items to be painted but not specifically mentioned shall be painted in a color selected by the Engineer.

5. All requirements of the Occupational Safety and Health Act (OSHA) concerning color coding and safety markings shall be considered part of these specifications.

END OF SECTION

SECTION 02791

ROOFING UNDERLAYMENT, HIGH-TEMPERATURE

PART 1 GENERAL

1.1 SUMMARY

A. This Section specifies a self-adhering sheet membrane used as underlayment for sloped roofs.

1. High temperature application, 240F resistance.

B. Related Sections: Refer to the following specification sections for coordination:

1. Section 02790 – Building Construction.

C. Referenced Standards: Comply with the requirements of the following standards published by ASTM International to the extent referenced in this section.

1. ASTM D412 - Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers - Tension.
2. ASTM D461 - Standard Test Methods for Felt.
3. ASTM D 903 - Standard Test Method for Peel or Stripping Strength of Adhesive Bonds.
4. ASTM D1970 - Standard Specification for Self-Adhering Polymer Modified Bituminous Sheet Materials Used as Steep Roofing Underlayment for Ice Dam Protection.
5. ASTM D3767 - Standard Practice for Rubber—Measurement of Dimensions.
6. ASTM E96 - Standard Test Methods for Water Vapor Transmission of Materials.
7. ASTM G90 – EMMAqua test.

1.2 SUBMITTALS

A. Product Data: Submit manufacturer's product data and installation instructions.

1.3 QUALITY ASSURANCE

A. Regulatory Requirements: Comply with requirements of authorities having jurisdiction and applicable codes at the location of the project.

B. Manufacturer: Minimum 10 years experience producing roofing underlayment.

C. Installer: Minimum 2 years experience with installation of similar underlayment.

1.4 DELIVERY, STORAGE AND HANDLING

A. Deliver materials and products in unopened factory labeled packages. Protect from damage.

B. Cover materials and store in dry condition between temperatures of 40 and 90 degrees F (5 and 32 degrees C). Use within one year of date of manufacture. Do not store at elevated temperatures as that will reduce the shelf life of the product.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Self-Adhering Sheet Membrane Roof Underlayment:

1. Material: Cold applied, self adhering membrane composed of an innovative and proprietary rubberized asphalt adhesive and interwound with a disposable release sheet. An embossed, slip resistant surface is provided on the high performance film with UV barrier properties.
2. Membrane Thickness: 40 mils (1.02 mm) per ASTM D3767 Method A.
3. Membrane Tensile Strength: MD 33 lbf/in, CD 31 lbf/inch per ASTM D412 Die C Modified.
4. Membrane Elongation: 250% per ASTM D412 Die C Modified.
5. Low Temperature Flexibility: Unaffected at -20 degrees F (-29 degrees C) per ASTM D1970.
6. Adhesion to Plywood: 5.0 lb/in. width (876 N/m) per ASTM D903.
7. Maximum Permeance: 0.05 perms (2.9 ng/sgms Pa) per ASTM E96.
8. Maximum Material Weight Installed: 0.22 pounds/sqft (1.1 kg/sqm) per ASTM D461.
9. Service Temperature: 240 degrees F (115.6 degrees C) per ASTM D1204
10. Compatibility: Suitable for use under all types of sloped roofing with the exception high altitude climates where zinc, copper or Cor-Ten roof coverings are used.
11. Adhesive: Rubberized asphalt adhesive containing post-consumer recycled content, contains no calcium carbonate, sand or fly ash.
12. Exposure: Can be left exposed for a maximum of 120 days from date of installation per ASTM G90 – EMMAqua test.
13. Primer: Water-based Perm-A-Barrier WB Primer by Grace Construction Products.
14. Code and Standards Compliance:
    a. ASTM D1970.
    b. ICC-ES AC 48 Acceptance Criteria for Roof Underlayments for use in Severe Climate Areas.
    c. Underwriters Laboratories Inc. R13399 - Class A fire classification under fiber-glass shingles and Class C under organic felt shingles (per ASTM E108/UL 790).

PART 3 - EXECUTION

3.1 EXAMINATION

A. Prior to start of installation, inspect existing conditions to ensure surfaces are suitable for installation of roofing underlayment. Verify flashing has been installed. Starting work indicates installers acceptance of existing conditions.

3.2 INSTALLATION

A. Installation: Install roofing underlayment on sloped surfaces at locations indicated on the Drawings, but not less than at hips, ridges, eaves, valleys, sidewalls and chimneys, and surfaces over interior space within 36 inches (914 mm) from the inside face of the exterior wall. Strictly comply with manufacturer's installation instructions including but not limited to the following:

1. Schedule installation such that underlayment is covered by roofing within the published exposure limit of the underlayment.

2. Do not install underlayment on wet or frozen substrates.
3. Install when surface temperature of substrate is a minimum of 40 degrees F (5 degrees C) and rising.
4. Remove dust, dirt, loose materials and protrusions from deck surface.
5. Install membrane on clean, dry, continuous structural deck. Fill voids and damaged or unsupported areas prior to installation.
6. Prime concrete and masonry surfaces using specified primer at a rate of 500-600 square feet per gallon (12-15 sqm/L). Priming is not required for other suitable clean and dry surfaces.
7. Install membrane such that all laps shed water. Work from the low point to the high point of the roof at all times. Apply the membrane in valleys before the membrane is applied to the eaves. Following placement along the eaves, continue application of the membrane up the roof. Membrane may be installed either vertically or horizontally after the first horizontal course.
8. Side laps minimum 3-1/2 inches (89 mm) and end laps minimum 6 inches (152 mm) following lap lines marked on underlayment.
9. Patch penetrations and damage using manufacturer's recommended methods.

3.02 CLEANING AND PROTECTION

A. Protection: Protect from damage during construction operations and installation of roofing materials. Promptly repair any damaged or deteriorated surfaces.

B. Repair minor damage to eliminate all evidence of repair. Remove and replace work which cannot be satisfactorily repaired in the opinion of the Architect.

C. Provide temporary protection to ensure work being without damage or deterioration at time of final acceptance. Remove protective film and reclean as necessary immediately before final acceptance.

END OF SECTION

DIVISION 3

CONCRETE

SECTION 03250

CONCRETE

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Cast-in-place concrete for storm drainage system, paving, curb and gutter, slabs and walks.

B. Reinforcing Steel.

C. Concrete Curing.

D. Concrete Repair.

1.2 RELATED SECTIONS

A. Section 01410 - Testing and Laboratory Services.

B. Section 02410 - Patching Asphaltic Concrete Pavement.

C. Section 02420 - Concrete Curb and Gutter and Sidewalks.

D. Section 02625 - Sewer Force Main Systems.

E. Section 02500 - Storm Drainage System.

1.3 REFERENCES

A. ACI 301 - Specifications for Structural Concrete for Buildings.

B. ASTM C 33 - Concrete Aggregates.

C. ASTM C 94 - Ready-Mixed Concrete.

D. ASTM C 150 - Portland Cement.

E. ASTM C 260 - Air-Entraining Admixtures for Concrete.

F. ASTM C 494 - Chemical Admixtures for Concrete.

G. ACI 315 - Details and Detailing of Concrete Reinforcement.

H. ASTM A 82 - Cold Drain Steel Wire for Concrete Reinforcement.

I. ASTM A 185 - Welded Steel Wire Fabric for Concrete Reinforcement.

J. ANSI/AWS D1.4 - Structural Welding Code Reinforcing Steel.

K. ASTM A 615 - Deformed and Plain Billet Steel Bars for Concrete Reinforcement.

L. CRSI - Manual of Practice.

M. ASTM C 309 - Liquid Membrane - Forming Compounds for Curing Concrete.

N. ASTM D 2103 - Polyethylene Film and Sheeting.

O. FS TT-C-800 - Curing Compound, Concrete for New and Existing Surfaces.

1.4 QUALITY ASSURANCE

A. Perform work in accordance with ACI 301.

B. Obtain materials from same source throughout.

1.5 TESTS

A. Testing and analysis of concrete will be performed under provisions of Section 01400.

B. Submit proposed mix design of each class of concrete to Engineer for Review prior to commencement of work.

C. Test of cement and aggregates will be performed to ensure conformance with requirements stated herein:

1.6 PRODUCT DATA

A. Submit mill test certificates of supplied concrete reinforcing indicating physical and chemical analysis.

B. Provide product data for specified products.

C. Submit all manufacturer's installation instructions.

1.7 ENVIRONMENTAL REQUIREMENTS

A. Do not place concrete in temperatures less than 40 degrees F without Engineer's approval.

B. Maintain ambient temperature at 70 degrees F (minimum) for three days for curing.

PART 2 PRODUCTS

2.1 CONCRETE MATERIALS

A. Cement: ASTM C150, normal - Type 1, air entraining - Type 1A moderate, high early strength Type III, air entraining - Type III Portland Type; gray color.

B. Fine and Coarse Aggregates: ASTM C 33.

C. Water: Clean and not detrimental to concrete.

2.2 ADMIXTURES

A. Air Entrainment: ASTM C 260.

B. Chemical Admixture: ASTM C 494 Type A - water reducing. Type B - retarding. Type C - accelerating. Type D - water reducing and retarding. Type E - water reducing and accelerating.

2.3 CONCRETE MIX

A. Mix concrete in accordance with ASTM C 94.

B. Provide concrete for all wingwall, footing and slab construction of the following characteristics:

1. Comprehensive Strength (7 days): 3200 psi

2. Comprehensive Strength (28 days): 4000 psi

C. Provide concrete for All Other Concrete Construction of the following characteristics:

Unit	Measurement
Comprehensive Strength (7 days):	2400 psi
Comprehensive Strength (28 days):	3000 psi

D. Use accelerating admixtures in cold weather only when approved by Engineer. Use of admixtures will not relax cold weather placement requirements.

E. Use set-retarding admixtures during hot weather only when approved by Engineer.

F. Add air entraining agent to all concrete mixes for concrete work.

2.4 REINFORCING STEEL MATERIALS

A. Reinforcing Bars: ASTM A 615, 60 KSI yield grade, billet-steel deformed bars with uncoated finish as specified on the plans.

B. Welded Steel Wire Fabric: ASTM A 185 (unless otherwise specified) plain type, coiled rolls, uncoated finish 6" x 6" mesh of 0.135" diameter.

C. Stirrup Steel - ASTM A 82.

D. Tie Wire: Minimum 16 gage annealed type - acceptable patented system.

E. Chairs, Bolsters, Bar Supports, Spacers: Sized and shaped for strength and support of reinforcement during installation and placement of concrete.

2.5 CURING MATERIALS

A. Water: Clean and not detrimental to concrete.

B. Membrane Curing Compound: ASTM C 309, FSTT-C-800.

C. Chem-trete curing compound by Trocal or equivalent.

PART 3 EXECUTION

3.1 INSPECTION

A. Verify anchors, seats, plates, reinforcement and other items to be cast into concrete are accurately placed, held securely, and will not cause hardship in placing concrete.

3.2 PREPARATION

A. Prepare previously placed concrete by cleaning with steel brush and applying bonding agent. Apply bonding agent in accordance with manufacturer's instructions.

B. At locations where new concrete is dowelled to existing work, drill holes in existing concrete, insert steel dowels and pack solid with non-shrink grout.

C. Before placing concrete, clean reinforcement of foreign particles or coating and remove any foreign material in forms by sweeping, blowing or washing.

3.3 PLACING CONCRETE

A. Notify Engineer minimum 24 hours prior to commencement of concreting operations.

B. Place concrete in accordance with ACI 301.

C. Hot Weather Placement: ACI 301.

D. Cold Weather Placement: ACI 301.

E. Ensure reinforcement, inserts, embedded parts, formed joints are not disturbed during concrete placement.

F. Maintain concrete cover around reinforcing as follows:

ITEM	COVERAGE
Supported Slabs and Joists	2 inch
Walls (Exposed to Weather or Backfill)	2 inch
Footings & Concrete Formed Against Earth	2 inch
Slabs on Fill	2 inch

G. Place concrete continuously between predetermined construction and control joints. Do not break or interrupt successive pours such that cold joints occur.

H. Excessive honeycomb or embedded debris in concrete is not acceptable. Notify Engineer upon discovery.

3.4 FINISHING

A. Provide concrete surfaces to be left exposed, concrete walls with rubbed sack rubbed finish or as directed by the Engineer.

3.5 PATCHING

A. Notify Engineer immediately upon removal of forms.

B. Patch imperfections.

3.6 DEFECTIVE CONCRETE

A. Modify or replace concrete not conforming to required levels and lines, details and elevations.

B. Repair or replace concrete not properly placed or of the specified type.

3.7 FIELD QUALITY CONTROL

A. Field inspection and testing will be performed under provisions of Section 01400.

B. Maintain records of placed concrete items. Record date, location of pour, quantity, air temperature and test samples taken.

3.8 PROTECTION

A. Protect all finished work.

B. Immediately after placement, protect concrete from premature drying, excessively hot or cold temperatures and mechanical injury.

C. Maintain concrete with minimal moisture loss at relatively constant temperature for period necessary for hydration of cement and hardening of concrete.

END OF SECTION

DIVISION 4-14

(NOT USED)

DIVISION 15

SECTION 15100

TRAFFIC CONTROL PLAN

1.1 PURPOSE: The purpose of this section is to provide a plan for maintenance and control of traffic during work under this contract.

This section sets forth procedures that will permit traffic to pass through or around the project area safely and with a minimum of inconvenience.

2.1 GENERAL: These requirements are in addition to the SCDOT Standard Specifications setting forth certain specific procedures and do not relieve the Contractor of any responsibilities place upon him by the SCDOT Standard Specifications.

All control devices shall conform to the South Carolina Manual on Uniform Traffic Control Devices, latest edition (hereinafter referred to as - SCMUTCD) unless Engineer gives authorization in writing to do otherwise.

This work shall consist of the furnishing, installation, maintenance, relocation and removal of signs, traffic cones, barrels, barricades, warning lights, flaggers, removal of conflicting pavement marking lines, and other traffic control devices which are used for the purpose of regulating, warning, or directing traffic during construction of the project. It shall also include temporary concrete barrier and crash cushions and other devices if specified in the Drawings. Pavement markings shall also be the responsibility of the Contractor. All items shall remain the property of the Contractor unless otherwise specified in the Drawings or Contract Documents.

1. Specific reference is made to Subsection 107.11 of the SCDOT Standard Specifications - Barricades, Warning and Detour Signs, which is expanded or modified as follows:

    1. Any construction being performed adjacent to the traveled lanes shall be adequately marked by lights or barricades, or both, as shown in the SCMUTCD.

    2. The Contractor performing the work shall be responsible for the erection and maintenance of all traffic control devices during construction as required in the SCMUTCD.

    3. All reflecting materials used on traffic control devices shall conform to the South Carolina Department of Transportation Specifications for Reflective Sheeting. All signs, barrels, barricades, and other traffic control devices used on this project are to be covered with Type III Reflective Sheeting, unless otherwise specified in the Contract Documents or SCDOT Encroachment Agreement. The background material for the signs is to be constructed of either aluminum or steel. Aluminum is to meet the requirements of SCDOT Specifications for Flat Sheet Aluminum Sign Blanks, latest edition. The steel blank shall be made of 14 Gauge materials.

        No splices will be permitted in reflective sheeting, except for signs that cannot be covered with a single piece of the widest material available from the sheeting manufacturer. Only one splice is permitted per sign and it shall be on a centerline of the sign. Splices shall overlap not less than 3/16" except butt splices may be used on signs processed with transparent colors, with a gap not greater than 1/32" allowed. In

horizontal overlapped splices, the top portion shall overlap the bottom portion, as viewed when the sign is in an upright position. No screening paints are permitted between the sheeting of overlapped splices. When splicing is done, the reflective sheeting must be carefully matched for color to provide uniform appearance both day and night.

4. All signs and barricades shall be mounted on supports constructed to yield upon impact to minimize hazards to motorists, as indicated in Section 5-2.04 if SCMUTCD.

5. Barrels or drums used for traffic control shall be constructed of a plastic material. Metal barrels or drums will not be allowed.

6. When not in use, all barricades, signs, or other traffic control devices shall be either masked or removed and faced so as not to confuse the traveling public.

7. The Contractor shall maintain all signals and other traffic control channeling devices 24 hours a day. Contractor's personnel shall be available to maintain all traffic control devices as needed. All signs and other traffic control and channeling devices shall be kept clean, aligned and in good repair at all times during their use.

8. The Contractor shall provide all pavement markings - temporary and permanent markings. Temporary markings are markings that are required during construction due to the following reasons:

    1. Asphalt mixtures covering existing markings.
    2. Changes in traffic patterns.
    3. Changes in alignment due to relocations.
    4. Maintenance and replacement of any existing markings which have lost their reflectivity or have become damaged during construction.

    Permanent markings are placed on the final surface (including relocations) when the traffic pattern will no longer be changed. When a road is resurfaced, pavement markings are to be applied after each application of asphalt mix, and bituminous surface treatment including the final course.

    Pavement Markings - temporary and permanent - will include but not be limited to lanes lines, no passing zone markings, edge lines and any transverse lines, and are to be in place at the end of each days' work.

    When a road is widened, the Contractor is to provide all markings, temporary and permanent, necessitated by the widening including, but not limited to, all lane lines, median edge lines (solid and skip) and solid edge lines.

    Temporary pavement markings shall use "3 Min. Paint" and Specifications for "3 Min. Paint" are available from the Research and Materials Laboratory, SCDOT, Shop Road.

    All temporary painted lines are to be applied at a wet film thickness of 15 mils ∀ 1 mils and are to have glass beads applied at 6 lbs. Per gallon of binder. Before applying the painted lines, the roadway surface is to be cleaned by sweeping to

assure a clean surface for the application of the paint. Permanent markings will be thermoplastic.

The lines are to be of the width and length prescribed by the SCMUTCD and/or the Engineer. Dashed lines are to be 4 inches wide by 10 feet long with a 30 foot gap.

Edge lines are normally solid and 4 inches wide. No passing zone markings are to be provided in accordance with procedures prescribed in the SCMUTCD.

The contractor shall follow standard practices in applying paint to insure that a straight line with true edges and a clean cut is obtained.

2. The Contractor shall be responsible for and shall furnish flaggers, appropriately equipped and instructed, when required to regulate the flow of vehicular traffic around and through the project during the prosecution of the work. Flaggers are to use a STOP/SLOW paddle. The use of the flags will NOT be permitted.

3. The Engineer reserves the right to restrict construction operations and/or lane closures when the continuance of the work and/or lane closures would seriously hinder normal traffic flow during holidays, extended holiday periods weekends, special events or at other times when traffic is unusually heavy. Where specified on the Drawings, streets with high volume of traffic are not to be blocked or lanes closed during specified periods.

4. On roadways open to public travel, the Contractor's trucks and other vehicles will be required to travel in the direction of the normal roadway traffic. When the equipment is not in use, on roadways open to public travel, the Contractor's equipment or vehicles shall be parked well away from the travel lanes so as to lessen the possibility of the equipment being hit by a vehicle. If protection devices are in place such as guardrail or concrete barriers, the equipment can be parked closer to the travel lanes.

5. When working adjacent to or over travel lanes, the Contractor shall insure that dust and other debris from his operation does not endanger normal traffic operations.

6. The contractor shall schedule and arrange his work, equipment and materials to insure the least inconvenience and the utmost in safety to the traveling public and to the Contractor's and the Department's forces.

7. Any existing permanent signs in conflict with any shift or change in traffic patterns or lanes shall be masked, removed or covered and appropriate temporary signing shall be installed by the Contractor to the satisfaction of the Engineer. When the conflict is removed, the Contractor shall immediately re-erect or replace the previously existing permanent signs.

8. Where a specific condition is not covered in the Contract Documents, prior to beginning such work causing the condition, a plan of traffic control shall be agreed upon between the Contractor and the Engineer.

9. All construction signs, whether portable or with supports embedded in earth, are to be leveled and have a mounting height as specified in the SCMUTCD. Mounting height is defined as the distance from bottom edge of the lowest sign to edge of traveled way.

10. When any lane on a multi-lane road is closed for any duration, the Contractor shall provide a large flashing arrow-board sign. The flashing arrow shall be used at the beginning of the taper for a lane closure. One may also be required in front of the construction as specified in the SCMUTCD.

11. In order to provide tor the safe movement of traffic, during the rough grading operation, the earth adjacent to the existing pavement to be retained and widened shall be excavated in such a manner so as to maintain a slope no steeper than 6:1 away from the edge of the existing pavement until the fine grading operation is commenced.

END OF SECTION

SECTION 15200

REMOVAL SALVAGE AND DISPOSAL OF EQUIPMENT AND MATERIALS

1.01 **DESCRIPTION** - This section consists of the Removal and Salvage or the Removal and Disposal of equipment and materials, during the construction of this project. Construction includes new installations, and the modification, or removal of existing pump stations equipment.

A. **GENERAL**

1. Removal and Salvage

These items are to be carefully removed from the job site, salvaged, and returned to the Owner. The items of major equipment to be salvaged are listed on the Drawings. The Contractor shall deliver, (and obtain a RECEIPT for), the salvaged equipment, to:

City of Myrtle Beach
Department of Public Works ("Sewer Department")
3210 Mr. Joe White Avenue

2. Disposal

Material NOT to be salvaged shall be removed from the job site, become the property of the Contractor; and should be properly disposed by the Contractor, at an APPROVED LAND FILL (or material reclamation yard). Any materials designated as HAZARDOUS WASTE shall be disposed in accordance with regulations enforced by the SC Department of Health and Environmental Control (DHEC), Bureau of Solid and HAZARDOUS Waste; (803)734-5000 for information.

3. Inspection

Removal and disposal quantities will not be measured as pay items, but shall be included in the lump sum bid for Removal, Salvage, and Disposal. FINAL ACCEPTANCE and Final Payment will be withheld, if the Contractor has not removed unneeded equipment from the job site, and if the Contractor cannot present RECEIPTS from the Owner showing that the salvaged equipment has been delivered to the Owner as specified.

4. Holes

Every hole caused by removing old equipment shall be filled or covered up the same day for safety.

2.01 **METHOD OF MEASUREMENT**

The Removal, Salvage, and Disposal of traffic signal materials and related equipment, will not be measured but shall be paid as a Lump Sum item covering all intersections named in the Contract. The related costs of transportation, disposal, concrete, pavement repair, will not be measured for payment, but shall be included in the bid price of Removal, Salvage, and Disposal.

END OF SECTION

DIVISION 16

ELECTRICAL

SECTION 16001

GENERAL ELECTRICAL PROVISIONS

PART 1 - GENERAL

1.01 DESCRIPTION

A. Work Included:

1. The work shall include the furnishing of all labor, material, equipment, and performing all operations indicated, specified, or necessary for a complete electrical system. All electrical work will be done under the general contract by licensed electricians or subcontractors unless separate bids are called for in the Bid Documents.

1.02 CODES AND QUALITY ASSURANCES

A. Electrical Systems: The Contractor shall provide detailed shop drawings of all electrical devices. These shop drawings will be prepared based on the recommendations of the equipment manufacturers and applicable codes.

B. Codes and Standards: Work shall be in accordance with the provisions of the following Codes and Standards.

1. Southern Standard Building Code, as amended.

2. NFPA70 National Electrical Code. Latest Edition.

3. Applicable Local Codes and Ordinances: Where sizes or capacities are specified which are in excess of the minimum requirements of these Codes, such sizes or capacities shall prevail.

C. All materials provided shall be new and shall be approved by the Underwriter's Laboratories, Inc. wherever that agency has applicable standards.

D. Permits and Licenses:

1. The Contractor shall obtain all permits and licenses required for his work and shall pay all fees in connection with such permits and/or licenses.

E. Workmanship:

1. Poor workmanship shall be rejected and the work reinstalled when, in the judgment of the Engineer, the workmanship is not of the highest quality.

2. Where outlets are installed in masonry walls, holes shall be cut with a masonry saw under the supervision of the Electrical Contractor.

3. All work shall be performed at such times as are required by the progress of the job.

F. Completeness:

1. It is the intent of the Contract Documents to provide complete systems.

2. Completeness shall mean not only that all material and equipment has been installed properly, but that all material and equipment has been installed and has been adjusted, and that, in the opinion of the Engineer, all material and equipment is operating as designed.

G. Specification Intent:

1. Where items are specified by catalog number, type, or manufacturer, it is for the purpose of establishing quality, general appearance, and function desired. Items by other manufacturers of equal quality and similar design may be submitted to the Engineer for consideration for use on the job. The Engineer's evaluation of the proposed substitution shall be final. Wherever three or more manufacturer's types or brands are listed herein, the Contractor shall provide one of the items specified.

1.03 EQUIPMENT IDENTIFICATION:

A. Each of electrical equipment installed shall be identified by an etched laminated plastic nameplate, in addition to the manufacturer's nameplate. The plastic plate shall clearly identify the item of its intended use and shall be securely fastened to the equipment with sheet metal screws.

1.04 PAINTING

A. Factory Finishes:

1. Any equipment shipped with a factory applied finish shall be touched up to repair any damage to the finish so that it is the same as new.

B. Unfinished Items:

1. Exposed conduit systems, boxes, and cabinets in all areas to be painted as specified on the Contract Drawings, shall be painted.

2. All items in finished areas will be painted by Contractor.

1.05 CUTTING AND PATCHING

A. Cutting and patching necessary for the proper installation of the work under this contract shall be by the Contractor. Patched areas shall be refinished to match adjacent undisturbed areas.

END OF SECTION

SECTION 16111

CONDUIT

PART 1 – GENERAL

1.01 SCOPE

A. The work covered by this section includes furnishing all labor, equipment, and materials required to install electrical conduit and fittings as specified herein and/or shown on the Drawings.

B. The Contractor's attention is called to the fact that all conduits and conduit fittings are not necessarily shown completely on the Drawings, which are more or less schematic. However, the Contractor shall furnish and install all conduit and conduit fittings indicated or required for the proper connection and operation of all equipment and services requiring such conduit.

1.02 SHOP DRAWINGS AND ENGINEERING DATA

Shop drawings and engineering data shall be submitted in accordance with the requirements of the section entitled "Submittals" of these Specifications.

1.03 STORAGE AND PROTECTION

Store and protect conduit and fittings in accordance with the manufacturer's recommendations and the requirements of these Specifications. Conduit shall be stored aboveground and adequately supported.

1.04 GUARANTEE

Provide a guarantee against defective equipment and workmanship in accordance with the requirements of these Specifications.

PART 2 – PRODUCTS

2.01 GENERAL

A. Unless otherwise shown or specified, all conduits shall be rigid non-metallic conduit.

B. All primary power conduits shall be buried with 4' or more of cover. Concrete encasement of the conduits shall not be allowed without prior approval from Santee Cooper.

C. Damaged, dented, flattened, or kinked conduit shall not be used.

2.02 RIGID NONMETALLIC CONDUIT

A. Rigid nonmetallic conduit shall be SCH 40 heavy wall polyvinyl chloride (PVC) electrical conduit rated for 90EC conductors and conforming to NEMA TC-2, Type EPC-40-PVC. It shall be listed by Underwriters Laboratories in conformance with the National Electrical Code. Conduit fittings, elbows, and joint cement shall be produced by the same manufacturer as the conduit. Conduits shall be as manufactured by Carlon, Borg-Warner, or equal.

2.03 BENDS AND SWEEPS

A. All abrupt changes in direction of a conduit run shall be made with a sweep of the same diameter as the rest of the conduit run, and having the following minimum radii for each conduit size:

Minimum Sweep radii for Project:

1" Conduit	-	2' Radius
1 ¼" Conduit	-	2' Radius
2" Conduit	-	3' Radius
3" Conduit	-	3' Radius
4" Conduit	-	4' Radius
6" Conduit	-	4' Radius

2.04 COUPLINGS

A. All transitions between PVC and HDPE conduit shall be accomplished using a suitably air and water tight coupler at the joint. The coupling shall be locking to eliminate pull-out of either conduit from the end of the coupling. The locking couplings shall be manufactured for the same size conduit as the joint will be installed upon. The locking couplings shall be Shur-Lock II by A-D Technologies, Push2Connect Couplers by B&C, or other approved equal.

PART 3 – EXECUTION

3.01 GENERAL

A. Minimum size conduit shall be 1 inch except where noted otherwise, and no conduit shall have more than 40 percent of its internal area occupied by conductors.

B. During construction, all installed conduits shall be temporarily plugged, capped, or otherwise protected from the entrance of dust, trash, moisture, etc., and any conduits which may become clogged shall be replaced. No conductor shall be pulled in until all work that might cause damage to the conduit or conductors has been completed.

C. Unless otherwise shown or specified, exposed rigid conduit shall be installed parallel or at right angles to structural members, surfaces, and building walls.

D. Two or more conduits in the same general routing shall be parallel with symmetrical bends.

E. Where groups of conduits terminate together, provide template to hold conduits in proper relation to each other and to building.

F. Conduits shall be plugged or capped with plastic caps during construction to protect ends and prevent entrance of dirt and water.

3.02 INSTALLATION OF RIGID NONMETALLIC CONDUIT

A. Field bending of polyvinyl chloride conduit is not allowed. Torches or flame-type devices shall not be used to bend conduit.

B. When joints are to be made with polyvinyl chloride conduit, the conduit shall be cut with a fine-tooth saw and deburred. Conduit ends shall be wiped clean of dust, dirt, and shavings, and shall be dry. A solvent cement shall be applied to bond the joint. The joint should be watertight.

C. Polyvinyl chloride conduit shall be installed in accordance with the manufacturer's specifications and recommendations.

3.03 INSTALLATION OF UNDERGROUND CONDUIT

A. No conduit shall be concealed or covered until the Engineer has inspected the conduit for proper installation and accurate placement.

B. The Contractor shall be responsible for all excavating, draining, trench forming of duct assembly, protective concrete envelope, backfilling, and removal of excess earth.

C. Underground conduit shall be installed with a minimum 3-inch per 100-foot downward slope for drainage. Drains shall be provided at all low points.

D. Bends and turns shall be made using long sweeps. Ninety-degree bends will be used only where approved by the Engineer.

E. All underground conduit runs for primary power service shall be at least 48 inches below grade and shall have a minimum conduit separation of 6 inches. Conduit shall not be encased in concrete without prior approval from Santee Cooper.

F. All underground conduit runs shall be rodded, followed by a swab to clean out any obstructions which may cause cable abrasions.

G. All underground conduit runs shall be marked by a strip of permanently colored red polyethylene tape, 0.0004 inch thick and 6 inches wide, buried above the conduit and 6 inches below finished grade.

H. After conduits have been installed to their termination point, the Contractor shall install rope into each conduit run, with a tag on the end indicating the owner and size of each conduit. This rope shall be polypropylene, with a minimum tensile strength of 100 Newtons (240 pounds), which shall remain in place for future use.

I. Conduit bends, conduit bodies (condulets), sweeps, pulling boxes, miscellaneous fittings, couplings, adapters, bushings, locknuts, and other items shall be incidental to conduit installation and shall not be measured.

J. All conduit runs shall be marked with a semi-permanent color coding system on each conduit run. The color coding system shall be consistent throughout the execution of the contract. The color coding system will help the contractor install the conduit runs correctly, and will assist the utility companies in determining the proper conduits to use for when performing the conversions. All conduit stub-ups, and vault conduit ends, shall have a visible color identifier on the conduit end at the completion of Phase One and Two of the project. The Engineer shall approve the color code system prior to installation of the conduit bank.

END OF SECTION

SECTION 16300

SEWAGE ELECTRICAL VFD CONTROL PANEL

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Summary of Work.

B. Electrical Controls.

C. Control Equipment.

1.02 RELATED SECTIONS

A. Section 02650 - Horizontal Self-Priming Centrifugal Pumps.

B. Section 02770 - Electrical.

C. Section 16001 - General Electric Provisions.

D. Section 16100 - Electrical Conduit.

1.03 REGULATORY REQUIREMENT

A. Conform to applicable code and municipality requirements for materials and installation for the work in this section.

1.04 SUBMITTALS

A. Submit product data on all equipment included in the control panel.

1.05 WORK BY OWNER

A. The contractor will be responsible for all equipment, labor, and parts.

1.06 PUMP AND CONTROL PANEL COORDINATION

A. Control panel shall be packaged with the pump to ensure VFD pumps and VFD controls are compatible with each other.

PART 2 PRODUCTS

2.01 CONTROL PANEL

A. Enclosure:

1. Provide a 12 gauge Type 304 stainless steel enclosure complying with NEMA 4X

Cap standards, lockable, dead front type. Enclosure or enclosures fabricated of stainless steel or aluminum (painted steel will not be acceptable)

2. Provide a removable back panel of 12 gauge steel or aluminum, attached to the enclosure on collar studs, and of adequate size to accommodate all basic and optional components.

   a. Mount all components on the back panel securely utilizing screw and lock washers.

   b. Tap panel to accept mounting screws.

   c. Do not use any self tapping screws.

3. Enclosure doors shall be gasted with neoprene shall be hinged and shall be equipped with captive closure hardware.

4. A duplex ground fault indicating utility receptacle providing 115 Volts AC60 Hertz, single-phase current shall be mounted near the bottom of the control panel. All wiring except 250/480 V-3 phase to and from the electrical control panel shall be thru terminal blocks or terminal strips.

5. Back panel to be painted with 2 coats of white epoxy enamel.

6. For enclosures containing VFD's drives or electronic soft starts, proper ventilation, fans and filters shall be furnished.

7. Control cabinet shall be sized to meet applicable codes.

8. All operating controls and instruments shall be securely mounted and shall be clearly labeled to indicate function.

9. Cabinet shall contain a Hoffman Stainless Sheet type 4 x Hoffman air conditioning unit as sized to cool the components within cabinet.

10. 30 AMP 3-phase breaker for Zabco odor control system.

B. Control panel to be sized to meet applicable codes.

1. Spare Parts

   Furnish the following spare parts of type used to fabricate control panel.

   Two (2) - each type fuse
   Two (2) - each type relay
   One (1) - each type timer
   Two (2) - each type lamps
   One (1) - PLC Programmed
   One (1) - VFD Drive

2. Labels

All components used in the control panel shall have identification labels attached above the component - relays, fuses, and timers.

3. Component Substitution

Bidders wishing to use components other than specified herein shall submit shop drawings and data sheets for review to the Engineer. Submittals shall be received by the City of Myrtle Beach no later than ten (10) days prior to bid opening date.

4. Substitute components submittals received late will not be considered.

5. Written approval of substitute components required.

C. Motor Starters and Drives

1. Provide for each of the specified motors a Variable Frequency Drive (VFD) Square D ATV 61 Type of 150% or more at 1 Hz., 100% continuous operating torque with a 3:1 speed range without motor derating and 1% speed regulation ratio minimum. The drive shall have a DSP [digital signal processor] to improve response speed characteristics [.1 second torque response [approx.] achieved]. The unit should also incorporate an AIR [automatic voltage regulator] function to compensate for voltage drops, allowing high starting torque to be maintained. Automatic tuning will ensure simplified commissioning by matching the inverter and motor constants. Acceleration and deceleration shall be accomplished by means of "FUZZY LOGIC" circuit which will automatically calculate based on motor load and braking requirements. The drive should automatically select parameters enabling the motor to run at minimum current with respect to torque vs. load requirements. Motor noise shall be reduced by means of an I'M [intelligent power module] consisting of a high speed micro computer and a IGBT [insulated gate bipolar transistor].

The unit shall be as manufactured by Square "D".

a. All motor starters shall be Square "D"

D. PLC – Programmable Logic Controller. All PLC controlled equipment shall be provided with a local Hand–Off–Automatic (HOA) selector switch. Control by the PLC shall only be enabled when the respective local HOA selector switch is in the automatic position. In addition to the automatic controls described within, all equipment shall have the ability to be controlled in a remote manual mode and in the local manual mode through a hard-wired HOA connection, independent of the PLC control system.

1. OPERATOR INTERFACE TERMINAL CONTROL FUNTIONS (OIT) - The OIT System will be programmed with control functions and will only be available and functional when the local HOA switch is in the "Automatic" position. The system operator with the appropriate level of password controlled access shall be able to perform the following functions from the OIT:

A. Pumps
   a. Manually On/Off Pump #1

b. Manually On/Off Pump #2
c. Manually On/Off Pump #3
d. Manually On/Off Pump #4
e. Set Lead Pump On wetwell level set point
f. Set Lead Pump Off wetwell level set point
g. Set Lag Pump #1 On wetwell level set point
h. Set Lag Pump #1 Off wetwell level set point
i. Set Lag Pump #2 On wetwell level set point
j. Set Lag Pump #2 Off wetwell level set point
k. Set Lag Pump #3 On wetwell level set point
l. Set Lag Pump #3 Off wetwell level set point
m. Select pump #1 as lead pump
n. Select pump #2 as lead pump
o. Select pump #3 as lead pump
p. Select pump #4 as lead pump
q. Select automatic alternation of lead/lag pumps based on pump off or by hours
r. On the Lead Pumps upon request
s. Enter the wetwell level control set point (VFD mode only)
t. Enter the High/Low Wet Well Level alarm set points
u. Acknowledge PLC generated alarms

2. OPERATOR INTERFACE TERMINAL (OIT) DISPLAYS. The Control System Integrator shall create separate display points as required for each similar device at the station. Display points indicated shall be created from a combination of input, output and logical data from control logic within the PLC.

(A) Denotes OIT Alarm will be associated with data point. Provide adjustable High and Low threshold set points for alarms based on analog values as applicable.

3. PLC CONTROL ALGORITHMS

B. Pumps
a. Summer operations (20" and 24" force main to 36" force main)
b. Winter operations (20" force main to 20" force main)
c. 20" force main to 36" force main operation
d. 24" force main to 36" force main operation
e. 20" and 24" force main to 36" force main operation
f. 20" force main to 20" force main operation
g. 20" and 24" force main to 20" force main operation
h. 20" and 24" force main to 20" and 36" force main operation

Wet well level set points shall be programmed in the programmable controller for control actions corresponding to the following wet well levels:

a. Lead Pump On Level
b. Lead Pump Off Level
c. Pump #2 Pump On level or if lead pump over 3000 gpm flow
d. Pump #2 Pump Off Level

e. Pump #3 Pump On Level
f. Pump #3 Pump Off Level
g. Pump #4 Pump On Level
h. Pump #4 Pump Off Level
i. One Pump Run to Maximum GPM and Start Another Pump
j. Select Automatic Alternation of Lead/Lag Pumps Based on Level Pump Off or by Set Number of Hours
k. Wetwell High Level
l. Wetwell Low Level
m. Wetwell Level Control Set Point
n. Pump Down Mode Varying Wetwell Level and Elevation by a Set Time
    1. On (Time)
    2. Off (Time)

The programmable controller shall be programmed with level control logic to control the sewage level in the wet well between the operational set points or to maintain a set point level. The programmable controller shall start a delay timer when the sewage level in the wet well rises to the elevation of "Lead RSP start" level set point. When this timer times out, the programmable controller shall start the lead pump. If the "Maintain Level" control scenario is selected, the PLC will control the speed of the RSP through a PID loop to match the influent flow and maintain a constant wet well level. If the "Constant Speed" control scenario is selected, the RSP will operate at the maximum a speed that the VFD is configured to operate.

The lead pump shall run continuously as long as the influent flow rate into the wet well meets or exceeds the pump flow rate and the sewage level in the wet well remains above the pump stop level. When the sewage level in the wet well is drawn down to the "pump stop" level set point, the programmable controller shall stop the lead pump.

If the lead pump maximum flow rate cannot keep up with the influent flow and the sewage level in the wet well continues to rise to the "lag pump start" level set point, another adjustable start delay timer, in the programmable controller shall be started. When this timer times out, the programmable controller shall start the lag pump. As long as the sewage level is above the Lag pump stop level, both pumps shall run continuously. When the sewage level in the well is pumped down to the "lag pump stop" level set point the programmable controller shall shut down the lag pump. If both pumps are running, the PLC shall control the speed of both pumps to match the influent flow rate and a constant wet well level. All pumps shall be operated at the same speed.

When the Pump Alternator function is in the automatically alternate position, the lead/lag status of the pumps shall be automatically alternated at the end of every pump cycle or by a set timeframe.

The Operator shall be provided the ability to start the Lead RSP through a "Lead Pump Test" function programmed into the HMI/OIT. If the wet well level is above the Lead Pump Stop level, this function will

F. Components:

1. Provide the following components with the panel:
   a. Pilot run light for each motor.
   b. Lock-able enclosure.
   c. Condensation heater.
   d. Phase protection.
   e. High level alarm indication light.
   f. Alarm horn silence.
   g. Reset-motor over temperature.
   h. GFI 20A duplex receptacle with stainless steel cover.
   i. Control relays.
   j. Remote alarm terminals.
   k. "High temperature" indicator lamp.
   l. "Power on" indicating lamp.
   m. Temperature failure test push-button.

G. Pump Motor Alternator:

1. The PLC shall be programmed with Pump Motor Alternator based on time and/or pump off.

H. Control Circuits:

1. The control circuit shall be protected by a thermal magnetic air circuit breaker which shall be connected in such a manner as to allow control power to be disconnected from all other control circuits.

2. The control circuit shall be routed through a set of normally closed contacts on the Phase Monitor. In the event of a power failure, under voltage, over voltage or phase loss the Phase Monitor shall sense this condition, open its normally closed control contact and de-energize the control circuit relay, stopping all pumping actions. Once normal power has been restored all systems shall automatically return to normal operations.

I. Phase Monitor:

1. Phase Monitor shall be three-phase and voltage as specified in the proposal and manufactured by Diversified, Inc. or approved equal.

J. Control Components:

1. Two 15 amp, 120V, 60 Hertz thermal magnetic breakers shall be installed and wired to a terminal strip for customer's circuitry. These breakers shall be wired from an isolated terminal block or approved manner.

2. A signal relay shall be installed and wired to the terminal strip for customer's data communications connections.

3. In the event of power or control power loss, a set of normally open contacts on the control relay shall close and notify maintenance personnel of the failure through customer's data communications system.

4. Manual operations shall override all shut down systems, but not the motor overload relay.

5. Selector switch shall be toggle switches meeting military standards (MS) for quality. Switch contacts shall be rated 10 amps minimum at 120V non-inductive.

K. High Temperature Shutdown:

1. Provide high temperature shutdown for each motor utilizing the temperature switches embedded in the motor winding.

a. Under high temperature conditions switch shall open, de-energizing the motor starter and stopping the pump motor.

b. High motor temperature shutdown device shall be manual reset type. Automatic reset of such a circuit shall not be acceptable.

c. One (1) red indication light for each pump shall be mounted on the inner swing door and shall indicate that a pump has been stopped in the event of a night temperature condition.

L. Provide the following components and mount on the back plate:

1. Provide a 115V control circuit transformer (open core and coil type) with a primary circuit breaker and secondary circuit breaker for:

a. Control

b. Duplex receptacle

1. A duplex ground fault indicating utility receptacle providing 115V AC 60 Hertz, single phase current, shall be mounted on the side of the control enclosure.

2. Receptacle circuit shall be protected by a 15A thermal magnetic circuit breaker.

3. Provide a manual reset for alarm horn.

4. Provide lightning arrester.

5. Provide power terminals and control terminals.

M. Pump Run Indicators:

1. Control panel shall be equipped with one green pilot light for each pump motor. Lights shall be wired in parallel with the related pump motor starter to indicate

that the motor is on or should be running.

2. A six (6) digital non-resettable time meter shall be installed for each pump motor. Each time meter shall be wired in parallel with its related pump motor to indicate total running time in hours and tenths.

N. Wiring:

1. Pump Control Panel:

   a. The unit shall be completely factory wired except for the supply power, motors connections and remote devices.

2. All wiring, workmanship and schematic wiring diagrams shall be in compliance with applicable standards and specifications set forth by local and the (NEC) National Electrical Code.

3. The control panel shall be completely wired by the manufacturer. Use intermival blocks and terminal strips for supply poser and remote devices. All user serviceable wiring shall be type MTW or THHN, 600 volts and be color codes as follows:

a.	Line and load circuits, AC or DC power	Black
b.	Control circuits less than line voltage	Red
c.	DC control circuit	Blue
d.	Interlock control circuit, external source	Yellow
e.	Equipment grounding conductor	Green
f.	Current carrying ground	White
g.	Hot with circuit breaker open	Orange

4. Control circuits inside the control panel. With the exception of internal wiring of individual components, shall be 16 gauge minimum, type MTW motor branch wiring stall be sized, based on actual motor horsepower. Wiring conduit shall be 16 gauge minimum. Motor branch wiring shall be sized based on horsepower gauge minimums.

5. Control panel wiring shall be clearly numbered at both ends of wire within (1/2") half inch of its termination point. Termination of more than two (2) wires under terminal shall not be accepted.

6. Motor branch conductors and other power conductors, shall not be loaded above 60 degree C temperature rating. Circuits of 100 amps or less, nor above 75 degree C on circuits above 100 amps. Wires shall be clearly numbered at each end in conformance with applicable standards.

7. All wire connections in the control panel shall be of the tongue type with nylon insulated shanks. All wiring on the sub-plate shall be bundled and tied. All wiring extending from components mounted on the door shall be terminated on terminal strips mounted on the back plate.

8. Wire Bundles

a. Control conductors connecting components mounted on the enclosure door shall be bundled and tied in accordance with good commercial practice.

b. Bundles shall be made flexible at the hinged side of the enclosure.

c. Adequate length and flex shall be so that the door can swing to its fullest open position with out undue mechanical stress or abrasion on conductors insulation.

d. Bundles shall be securely clamped and held in place with mechanical fastening devices on each side of the hinge.

9. Grounding

a. The pump control manufacturer shall ground all electrical equipment to the enclosure back panel.

b. The mounting surface of all ground connections shall have any paint removed before making final connections.

10. Agency Recognization

a. The control panel shall be "UL" #590 listed as a complete unit. **NOTE: THE USE OF ALL "UL" LISTED COMPONENTS SHALL NOT BE ACCEPTABLE IN LIEU OF THE "UL" LABEL.**

O. Design control sequence so that panel is functioning automatically again after a power failure and manual reset is not necessary.

1. Provide a time relay to prevent four (4) pumps from starting simultaneously after power failure.

P. Provide a terminal board for connection of line, pump leads will go direct to the VHD's.

Q. High water alarm and alarm silence.

1. High water alarm

a. Include front panel mounted silence switch.

b. Provide 115 volt AC, 40 watt, weather proof, alarm light and red globe, guard and mounting hardware.

c. Provide 115 volt AC, single projection, vibrating type horn with weatherproof housing, including mounting lugs and conduit tap.

d. Horn and light to operate simultaneously under alarm conditions.

e. Horn and light to be on at high level.

f. The electronic pressure switch shall be equipped with an additional electronic comporator and solid state relay to alert maintenance personnel to a high liquid level in the wetwell.

g. In the event that wetwell liquid reaches a preset high water alarm level, the high water alarm output shall energize a signal relay.

h. An indicator, visible on the front of the control panel, shall indicate that a high wetwell level exists.

i. The signal relay shall maintain the alarm signal until the wetwell level has been lowered and the circuit has been manually reset.

j. The signal relay shall have one normally open contact wired to a terminal strip for customer date communications connections.

k. High water alarm float ball system designed to activate relay for data communications.

2. Alarm Silence Switch

a. An alarm silence switch and relay shall be installed and wired to permit maintenance personnel to de-energize the external alarm device while corrective actions are underway.

b. After silencing the alarm device, manual reset of the signal relay shall provide automatic reset of the alarm silence relay.

c. Signal relay shall have one normally open contact wired to a terminal strip for customer data communications connections.

3. Level Control Backup System (Float Switches)

a. Float Switches:
(Start)
(Stop)
(Alarm)

b. Furnish three (3) normally open float switches, one for Start, one for Stop and one for Alarm.

c. The backup control system shall be designed to start and stop the lead pump motor and activate an external alarm system in response to high wetwell liquid levels.

4. Sequence of Operations

a. Rising and falling liquid levels in the wetwell shall cause switches within floats to open and close, providing start, stop and alarm signals for control

components. Intrinsically safe relays for high water alarms and pump motor function.

b. Should wetwell liquid level rise and activate the high level float switch assembly relay, it shall energize a signal relay. The signal relay shall complete a 120V AC circuit for an external alarm device. A mechanical indicator visible on the front of the control cabinet door shall indicate a high wet well condition. The signal relay shall maintain an alarm signal until wetwell liquid level has been lowered and the circuit manually reset.

c. Should wetwell liquid rise and activate the start float switch, it shall energize a control relay and start the lead pump motor. The lead pump motor shall operate until wetwell liquid level has been lowered and de-energize its stop relay and stops the lead pump motor.

R. Relays

1. Relays shall be Potter @ Blumfield KRPA or approved equal.

2. Each relay input shall be optically isolated from its output and shall incorporate zero crossover switching to provide high immunity to electrical noise.

3. The ON state of each relay shall be identified by illumination of a light emitting diode. The output of each relay shall be fused providing overload and short circuit protection.

4. Provide general purpose relays shall be plug-in type relay, silver cadmium oxide contacts.

5. Miniature relays are not acceptable.

S. Air Level Control System

1. Level Controller

a. The level control system shall be the air bubbler consisting of air bubbler piping which extends into the wetwell or (approved equal).

b. This shall be of the self-cleaning type with high strength corrosion resistant polymer air bell.

c. The air bubbler level control system shall consist of two (2) 0 to 5 PSI WISA or approved equal air compressors with a two (2) year warranty.

d. One (1) of the air compressors shall always be operating to produce a continuous positive pressure in the bubbler tube.

e. Air compressor system shall be designed to alternate the air compressors and allow only one (1) compressor to operate at any time.

f. If either compressor fails the other compressor shall operate the system.

g. If either compressor fails an indicator visible on the front of the inner swing door shall light alerting maintenance personnel that a failure has occurred and shall close a normally open set of contacts.

h. The contacts shall be wired to a terminal strip for the customer data system connection.

i. Pressure switches shall sense air pressure in the piping to determine when a high wet well liquid level exists, activate the high level alarm system, and determine when pumps are to be switched on and off.

j. Air bubbler piping, fittings and bubbler bell shall be installed complete by contractor.

k. The control panel manufacturer shall furnish and install all air bubbler piping and fittings from the control panel into the existing wet well. Bubbler pipe and fitting shall be ¼" Rubber Flex Tubing.

2. Provide a three (3) float ball back-up system for one pump control in the event of a controller failure. One (1) Start - one (1) Stop - one (1) High Level.

3. Sequence of Operations

a. The level control system shall continuously monitor wetwell level.

b. The system shall start the motor for one pump when liquid level in the wetwell rises to "lead pump start level."

c. When wetwell liquids rise to "lag pump" start level, the system shall start the second pump so that both pumps are operating to pump down wetwell.

d. Pumps shall stop at their respective stop levels. Levels shall be adjustable as described below.

4. Automatic Pump Alternation

a. The PLC level control system shall utilize its alternating system to select first one (1) pump, then the second pump, third, forth, etc. to run as lead pump for a pumping cycle.

b. Alternation shall occur at the end of the pumping cycle. Lead, second, third, fourth pump based on a programmed time period or pump down shot off cycle.

5. Electronic Pressure Switch

a. The electronic pressure switch shall include integral components toper form all pressure sensing, signal conditioning, EMI and RFI suppression, DC power supply and 120V output. Comparator shall be integrated with other components to perform as described below.

b. The electronic pressure switches shall be operating on a supply voltage of 108V to 132V AC, 60 Hertz, in an ambient temperature range of - 18 degree C (0 degree F) through +55 degree C (131 degree F).

c. Control range shall be 0 to 12.0 feet of water with an overall repeat accuracy of +\-0.1 feet of water.

d. The electronic pressure switch shall consist of the following integral components, pressure sensors, display, electronic comparators and output relays.

6. Pressure Sensors

a. The pressure sensor shall receive an input pressure from the bubbler system.

b. The transducer shall convert that input to a proportional electric signal for distribution to the display and electrical comparators.

c. The transducers' output shall be filtered to prevent control response to level pulsation's or surges.

d. The transducer range shall be 0 to 15 psi, temperature compensated for (-40 degree F) through (85 degree C) (+185 degree F), with a repeat accuracy of ± 0.25% full scale above a fixed temperature.

e. Transducer over pressure rating shall be three times full scale.

7. Display

a. The electronic pressure switch shall incorporate a digital panel meter which shall display liquid levels in the wetwell.

b. The meter shall be digital display, calibrated to read out in feet of water, accurate to within one-tenth foot (0.1 foot), with a full scale indicator of not less than 33 feet.

8. Electronic Comparators

a. Level adjustments shall be electronic comparator set points to control levels at which the lead and lag pumps start and stop.

b. Each of the levels shall be adjustable, and accessible to the operator through screen on the PLC.

c. Controls shall be provided to permit the operator to read the selected levels.

d. Such adjustments shall not require hard wiring, the use of electronic test equipment, artificial level simulation introduction of pressure to the electronic pressure switch.

9. Output Relays

   a. Each output relay in the electronic pressure switch shall be solid state.

   b. Each relay input shall be optically isolated from its output and shall incorporate zero crossover switching to provide high immunity to electrical noise.

   c. The ON state of each relay shall be indicated by illumination of a light emitting diode.

   d. The output of each relay shall be individually fused providing overload and short circuit protection.

   e. Each output relay shall have an inductive load rating equivalent to one NEMA size 4 contactor.

   f. A pilot relay shall be incorporated for loads greater than a size 4 contactor.

10. Quality Assurance

   a. The electronic pressure switch shall be subject to severe environmental test to minimize field failure.

   b. The test shall include but is not limited to vibration test, exposure to elevated temperatures, and burn under load.

   c. Additional testing may be conducted at the manufacturer's discretion.

11. Service Ability

   a. The electronic pressure switch shall be equipped with replaceable output fuses.

   b. The main circuit board assembly shall be provided with keyed plug-in connections to off board components, permitting main board removal without de-soldering.

   c. All printed circuits shall have a conformal coating applied to both sides to protect against moisture or fungus.

12. Independent Lag Pump

   a. Circuits designed in which application of power to the lag pump motor starter is contingent upon completion of the lead pump circuit shall not be acceptable.

T. Schematic and Shop Drawings

1. Furnish a minimum of three (3) sets of as-built drawings and wiring diagrams, and three (3) sets of shop drawings of all components used to fabricate the control cabinet and controls.

END OF SECTION