CONTRACT DOCUMENTS
AND
TECHNICAL SPECIFICATIONS

FOR

THE CITY OF NEWBERRY RECREATIONAL COMPLEX ON APPROXIMATELY 200-ACRES ALONG SC HIGHWAY 34 FOR THE CITY OF NEWBERRY

IN
NEWBERRY COUNTY, SOUTH CAROLINA

Newberry County
Economic Development
SOUTH CAROLINA

ALLIANCE CONSULTING ENGINEERS, INC.
BID DOCUMENT NO.: 2018-05
PROJECT NO. 17125-0036

NOVEMBER 2017

BID DOCUMENTS

CONTRACTOR:
ADDRESS:
CONTRACTOR'S LICENSE NUMBER:

ALLIANCE CONSULTING ENGINEERS

Alliance Consulting Engineers, Inc.
Post Office Box 8147
Columbia, SC 29202-8147
(803) 779-2078 ● (803) 779-2079 fax
www.allianceCE.com

SECTION 00 01 10

TABLE OF CONTENTS

THE CITY OF NEWBERRY RECREATIONAL COMPLEX ON APPROXIMATELY 200-ACRES ALONG SC HIGHWAY 34 FOR THE CITY OF NEWBERRY IN NEWBERRY COUNTY, SOUTH CAROLINA

PROJECT NO. 17125-0036
Bid Document No.: 2017-25
November 2017

DIVISION 00 – BIDDING AND CONTRACT REQUIREMENTS

DIVISION 01 – GENERAL REQUIREMENTS

DIVISION 33 – UTILITIES

END OF SECTION

SECTION 00 01 15

DRAWINGS INDEX

The City of Newberry Recreational Complex on Approximately 200-Acres along SC Highway 34 for the City of Newberry in Newberry County, South Carolina (Project No. 17125-0036, dated November 2017).

END OF SECTION

SECTION 00 11 13

ADVERTISEMENT FOR BID

Owner: Newberry County, South Carolina | Bid Document No.: 2018-05

Engineers: Alliance Consulting Engineers, Inc. | Project No.: 17125-0036

Separate sealed bids (Bid Document Number 2017-25) for The City of Newberry Recreational Complex on Approximately 200-Acres along SC Highway 34 for the City of Newberry in unincorporated Newberry County, South Carolina will be received at the Newberry County Courthouse Annex located at 1309 College Street in Newberry, South Carolina 29108 by Ms. Crystal Waldrop, Purchasing Director until 3:00 P.M. on April 25, 2018 after which will be publicly opened and read aloud at the Newberry County Courthouse Annex Conference Room. The bids must be received at the Purchasing Department in the Newberry County Courthouse Annex Building.

Base Bid: The proposed improvements for The City of Newberry Recreational Complex will consist of construction for Phase I of approximately 3,200 linear feet (LF) proposed roadway connecting to Glenn Street Extension into the park and two (2) parking areas, clearing and grading for forty-three (43) acres, storm drainage, erosion control measures, detention basins, half (0.5)-mile walking trail, two (2) multipurpose fields, two (2) baseball fields, field lighting systems, landscaping, and entrance signage.

Base Bid Alternate 1 - Water System: The proposed improvements will include approximately 1,800 LF of 6-inch water main, 1,160 LF of 2-inch watermain, and appurtenances.

Base Bid Alternate 2 – Wastewater System: The proposed improvements will include approximately 200 LF of six (6)-inch gravity wastewater, 445 LF of eight (8)-inch gravity wastewater, two (2) manholes to serve the pad areas of the concession/restroom building and splash pad/restroom area in phase II, wastewater lift station with fencing, 4,655 LF of four (4)-inch wastewater forcemain, existing driveway crossing along Glenn Street Extension, and one (1) connection of an existing wastewater gravity manhole.

Base Bid Alternate 3 – Irrigation System: The proposed improvements will include an irrigation system for the two (2) multipurpose fields and two (2) baseball fields, one (1) alternate baseball field in Alternate 5, a pump system connected in the existing lake on site, premanufactured shelter and pad, and electrical control system.

Base Bid Alternate 4 – Graded Aggregate Base Course (GABC) Access Drive and GABC Parking Area for the Existing Cabin: The proposed improvements will include the installation of the GABC stone access drive and parking area for the existing cabin adjacent to the existing lake on site.

Base Bid Alternate 5 – One (1) Additional Baseball Field: The proposed improvements will include the installation of the select import topsoil and clay soil on the base bid graded field area, fencing, two (2) dug outs, bleachers, and light system.

Base Bid Alternate 6 - Primary Electrical and Street Lighting Conduit: The proposed improvements will include the installation of the approximately 50,500 LF of two (2)-inch conduit and 400 LF of four (4)-inch conduit with pull boxes, and appurtenances.

Bidders on this work will be required to comply with the President's Executive Order No. 11246 and Order No. 11375, which prohibit discrimination in employment regarding race, creed, color, sex, or national origin.

The Instructions to Bidders, Bid Form, Contract, Plans, Specifications, Bid Bond, Performance Bond, Payment Bond, Addendum, Notice of Intent to Award and other contract documents may be examined at the following locations:

HCAC and iSqFt Planroom Partnership: hcacarolinas@isqft.com
Dodge Plan Rooms: Dodge.Docs@construction.com
Newberry County: www.newberrycounty.net/departments/purchasing
Engineers: Alliance Consulting Engineers, Inc., Columbia, SC P.O. Box 8147 Columbia, SC 29202-8147

Drawings, specifications, and contract documents may be obtained from the office of Alliance Consulting Engineers, Inc., Post Office Box 8147, Columbia, SC 29202-8147 upon a non-refundable payment of $300. When requesting drawings, specifications, or contract documents, provide the following information about your company: Mailing address; street (UPS) address; telephone number; and FAX number (if applicable).

Bidders must deposit security with all bids. Security shall be in the form of a certified check or bid bond made payable to the Owner and shall be for an amount equal to not less than five percent (5%) of the amount of the bid. Provisions of the security shall be as described in the Information for Bidders.

No bid will be considered unless the bidder is legally qualified under the provisions of the South Carolina Contractor's Licensing Law (South Carolina Code of Laws as amended on April 1, 1999, Chapter 11, Sections 40-11-10 through 40-11-428).

NOTICE TO BIDDERS:

There will be a NON-MANDATORY Pre-bid Conference for this project. The Non-Mandatory Pre-Bid will be held on Wednesday, April 11, 2018 at 10:00 AM at 1309 College Street in the Newberry County Courthouse Annex Conference Room, Newberry, South Carolina 29108. Each bidder shall fully acquaint himself with conditions of this Bid. The failure or omission of a bidder to acquaint himself with existing conditions shall in no way relieve him of any obligation with respect to this Bid or to the Contract.

NOTICE TO BIDDERS: Each bidder shall fully acquaint himself with the conditions relating to the scope and restrictions attending the execution of the work under the conditions of this Bid. The failure or omission of a bidder to acquaint himself with existing conditions shall in no way relieve him of any obligation with respect to this Bid or to the contract. All amendments to and interpretations of this solicitation shall be in writing and issued by Alliance Consulting Engineers, Inc. Newberry County or Alliance Consulting Engineers, Inc. shall not be legally bound by any amendment or interpretation that is not in writing. Award of the project is contingent on funding approval by the Newberry County Council and will be based on the total cost of the base bid and each approved alternate scope of work.

Contractors shall have a proper and active South Carolina License Classification to complete this project. No bid may be withdrawn within a period of sixty (60) days after the actual date of the opening and thereof.

The Owner reserves the right to waive any informalities or to reject any or all bids.

ENGINEERS
Alliance Consulting Engineers, Inc.
Post Office 8147 (Mailing)
Columbia, South Carolina 29202-8147
1201 Main Street, Suite 2020 (Physical/FedEx)
Columbia, South Carolina 29201-8147

OWNER
Newberry County
P.O. Box 156 (Mailing)
1309 College Street (Physical)
Newberry, South Carolina 29108

SECTION 00 21 13

INSTRUCTIONS TO BIDDERS

TABLE OF CONTENTS

ARTICLE 1 - DEFINED TERMS

1.01 Terms used in these Instructions to Bidders have the meanings indicated in the General Conditions. Additional terms used in these Instructions to Bidders have the meanings indicated below:

A. Issuing Office - The office from which the Bidding Documents are to be issued and where the bidding procedures are to be administered.

ARTICLE 2 - COPIES OF BIDDING DOCUMENTS

2.01 Complete sets of the Bidding Documents in the number and for the deposit sum, if any, stated in the Advertisement or Invitation to Bid may be obtained from Alliance Consulting Engineers, Inc., P.O. Box 8147, Columbia, South Carolina 29202-8147. The deposit will be nonrefundable and a FedEx account number must be provided for FedEx delivery of Plan Sets.

2.02 Complete sets of Bidding Documents shall be used in preparing Bids; neither Owner nor Engineer assumes any responsibility for errors or misinterpretations resulting from the use of incomplete sets of Bidding Documents.

2.03 Owner and Engineer, in making copies of Bidding Documents available on the above terms, do so only for the purpose of obtaining Bids for the Work and do not confer a license or grant for any other use.

ARTICLE 3 - QUALIFICATIONS OF BIDDERS

3.01 To demonstrate Bidder's qualifications to perform the Work, within five (5) days of Owner's request, Bidder shall submit written evidence such as financial data, previous experience, and present commitments.

ARTICLE 4 - EXAMINATION OF BIDDING DOCUMENTS, OTHER RELATED DATA, AND SITE

4.01 Subsurface and Physical Conditions

A. The General Conditions identify:

1. The reports of explorations and tests of subsurface conditions at or contiguous to the Site that Engineer has used in preparing the Bidding Documents.

2. The drawings of physical conditions in or relating to existing surface and subsurface structures at or contiguous to the Site (except Underground Facilities) that Engineer has used in preparing the Bidding Documents.

B. Copies of reports and drawings referenced in Paragraph 4.01.A are included herein. Those reports and drawings are not part of the Contract Documents, but the "technical data" contained therein upon which Bidder is entitled to rely as provided in Paragraph 4.02 of the General Conditions has been identified and established. Bidder is responsible for any interpretation or conclusion Bidder draws from any "technical data" or any other data, interpretations, opinions or information contained in such reports or shown or indicated in such drawings.

4.02 Underground Facilities

A. Information and data shown or indicated in the Bidding Documents with respect to existing Underground Facilities at or contiguous to the Site is based upon information and data furnished to Owner and Engineer by owners of such Underground Facilities, including Owner, or others.

4.03 Hazardous Environmental Condition

A. The General Conditions identify those reports and drawings relating to a Hazardous Environmental Condition identified at the Site, if any, that Engineer has used in preparing the Bidding Documents.

B. Those reports and drawings are not part of the Contract Documents, but the "technical data" contained therein upon which Bidder is entitled to rely as provided in Paragraph 4.06 of the General Conditions has been identified and established. Bidder is responsible for any interpretation or conclusion Bidder draws from any "technical data" or any other data, interpretations, opinions, or information contained in such reports or shown or indicated in such drawings.

4.04 Provisions concerning responsibilities for the adequacy of data furnished to prospective Bidders with respect to subsurface conditions, other physical conditions and Underground Facilities, and possible changes in the Bidding Documents due to differing or unanticipated conditions appear in Paragraphs 4.02, 4.03, and 4.04 of the General Conditions. Provisions concerning responsibilities for the adequacy of data furnished to prospective Bidders with respect to a Hazardous Environmental Condition at the Site, if any, and possible changes in the Contract Documents due to any Hazardous Environmental Condition uncovered or revealed at the Site which was not shown or indicated in the Drawings or Specifications or identified in the Contract Documents to be within the scope of the Work appear in Paragraph 4.06 of the General Conditions.

4.05 On request, Owner will provide Bidder access to the Site to conduct such examinations, investigations, explorations, tests, and studies as Bidder deems necessary for submission of a Bid. Bidder shall fill all holes and clean up and restore the Site to its former condition upon completion of such explorations, investigations, tests, and studies. Bidder shall comply with all applicable Laws and Regulations relative to excavation and utility locates. Engineer and Owner shall be notified prior to any site visits.

4.06 Reference is made to Article 7 of the General Conditions for the identification of the general nature of other work that is to be performed at the Site by Owner or others (such as utilities and other prime contractors) that relates to the Work contemplated by these Bidding Documents. On request, Owner will provide to each Bidder for examination access to or copies of Contract Documents (other than portions thereof related to price) for such other work.

4.07 It is the responsibility of each Bidder before submitting a Bid to:

A. Examine and carefully study the Bidding Documents, the other related data identified in the Bidding Documents, and any Addenda.

B. Visit the Site and become familiar with and satisfy Bidder as to the general, local, and Site conditions that may affect cost, progress, and performance of the Work.

C. Become familiar with and satisfy Bidder as to all federal, state, and local Laws and Regulations that may affect cost, progress, and performance of the Work.

D. Carefully study all: (1) reports of explorations and tests of subsurface conditions at or contiguous to the Site and all drawings of physical conditions in or relating to existing surface or subsurface structures at or contiguous to the Site (except Underground Facilities), which have been identified in Paragraph 4.02 of the General Conditions, and (2) reports and drawings of Hazardous Environmental Conditions at the Site which have been identified in Paragraph 4.06 of the General Conditions.

E. Obtain and carefully study (or accept consequences of not doing so) all additional or supplementary examinations, investigations, explorations, tests, studies, and data concerning conditions (surface, subsurface, and Underground Facilities) at or contiguous to the Site, which may affect cost, progress, or performance of the Work or which relate to any aspect of the means, methods, techniques, sequences, and procedures of construction to be employed by Bidder, including applying any specific means, methods, techniques, sequences, and procedures of construction expressly required by the Bidding Documents, and safety precautions and programs incident thereto.

F. Agree at the time of submitting its Bid that no further examinations, investigations, explorations, tests, studies, or data are necessary for the determination of its Bid for performance of the Work at the price(s) bid and within the times and in accordance with the other terms and conditions of the Bidding Documents.

G. Become aware of the general nature of the work to be performed by Owner and others at the Site that relates to the Work as indicated in the Bidding Documents.

H. Correlate the information known to Bidder, information and observations obtained from visits to the Site, reports and drawings identified in the Bidding Documents, and all additional examinations, investigations, explorations, tests, studies, and data with the Bidding Documents.

I. Promptly give Engineer written notice of all conflicts, errors, ambiguities, or discrepancies that Bidder discovers in the Bidding Documents and confirm that the written resolution thereof by Engineer is acceptable to Bidder.

J. Determine that the Bidding Documents are generally sufficient to indicate and convey understanding of all terms and conditions for the performance of the Work.

4.08 The submission of a Bid will constitute an incontrovertible representation by Bidder that Bidder has complied with every requirement of this Article 4, that without exception the Bid is premised upon performing and furnishing the Work required by the Bidding Documents and applying any specific means, methods, techniques, sequences, and procedures of construction that may be shown or indicated or expressly required by the Bidding Documents, that Bidder has given Engineer written notice of all conflicts, errors, ambiguities, and discrepancies that Bidder has discovered in the Bidding Documents and the written resolutions thereof by Engineer are acceptable to Bidder, and that the Bidding Documents are generally sufficient to indicate and convey understanding of all terms and conditions for performing and furnishing the Work.

ARTICLE 5 – PRE-BID CONFERENCE – NONE – INTENTIONALLY OMITTED

ARTICLE 6 - SITE AND OTHER AREAS

6.01 The Site is identified in the Bidding Documents. Easements for permanent structures or permanent changes in existing facilities are to be obtained and paid for by Owner unless otherwise provided in the Bidding Documents. All additional land and access thereto required for temporary construction facilities, construction equipment, or storage of materials and equipment to be incorporated in the Work are to be obtained and paid for by Contractor.

ARTICLE 7 - INTERPRETATIONS AND ADDENDA

7.01 All questions about the meaning or intent of the Bidding Documents are to be submitted to Engineer in writing. Interpretations or clarifications considered necessary by Engineer in response to such questions will be issued by Addenda mailed or delivered to all parties recorded by Engineer as having

received the Bidding Documents. Questions received less than seven (7) days prior to the date for opening of Bids may not be answered. Only questions answered by Addenda will be binding. Oral and other interpretations or clarifications will be without legal effect.

7.02 Addenda may be issued to clarify, correct, or change the Bidding Documents as deemed advisable by Owner or Engineer.

ARTICLE 8 - BID SECURITY

8.01 A Bid must be accompanied by Bid security made payable to Owner in an amount of five percent (5%) of Bidder's maximum Bid price and in the form of a certified check, bank money order, or a Bid Bond (on the form attached) issued by a surety meeting the requirements of Paragraphs 5.01 and 5.02 of the General Conditions.

8.02 The Bid security of the Successful Bidder will be retained until such Bidder has executed the Contract Documents, furnished the required contract security and met the other conditions of the Notice of Award, whereupon the Bid security will be returned. If the Successful Bidder fails to execute and deliver the Contract Documents and furnish the required contract security within fifteen (15) days after the Notice of Award, Owner may annul the Notice of Award and the Bid security of that Bidder will be forfeited. The Bid security of other Bidders whom Owner believes to have a reasonable chance of receiving the award may be retained by Owner until the earlier of seven (7) days after the Effective Date of the Agreement or sixty-one (61) days after the Bid opening, whereupon Bid security furnished by such Bidders will be returned.

8.03 Bid security of other Bidders whom Owner believes do not have a reasonable chance of receiving the award will be returned within seven (7) days after the Bid opening.

ARTICLE 9 - CONTRACT TIMES

9.01 **The City of Newberry Recreational Complex on Approximately 200-Acres along SC Highway 34 for the City of Newberry in Newberry County, South Carolina will be completed within two hundred seventy (270) calendar days after the Notice to Proceed has been issued. Issuance of the Notice to Proceed shall be issued after the Notice of Intent to Award has been issued and the ten (10) day protest period has passed County Council.**

ARTICLE 10 - LIQUIDATED DAMAGES

10.01 Provisions for liquidated damages are set forth in the Agreement

ARTICLE 11 - SUBSTITUTE AND "OR-EQUAL" ITEMS

11.01 The Contract, if awarded, will be on the basis of materials and equipment specified or described in the Bidding Documents, or "or-equal" materials and equipment as defined in paragraph 6.05 of the General Conditions, or those substitute materials and equipment approved by the Engineer and identified by Addendum. The materials and equipment described in the Bidding Documents establish a standard of required type, function and quality to be met by any proposed substitute or "or-equal" item. Request for Engineer's clarification of materials and equipment considered "or equal" prior to the Effective Date of the Agreement must be received by the Engineer at least 5 days prior to the date for the receipt of Bids. No items of material or equipment will be considered by Engineer as a substitute unless written request for approval has been submitted by Bidder and has been received by Engineer at least 15 days prior to the date for receipt of Bids. Each request shall conform to the requirements of paragraph 6.05 of the General Conditions. The burden of proof of the merit of the proposed item is upon the Bidder. Engineer's decision of approval or disapproval of a proposed item will be final. If Engineer approves any proposed substitute item, such approval will be set forth in an Addendum issued to all prospective Bidders. Bidders shall not rely upon approvals made in any other manner.

ARTICLE 12 - SUBCONTRACTORS, SUPPLIERS, AND OTHERS

12.01 If the General Conditions require the identity of certain Subcontractors, Suppliers, individuals, or entities to be submitted to Owner in advance of a specified date prior to the Effective Date of the Agreement, the apparent Successful Bidder, and any other Bidder so requested, shall within five (5) days after Bid opening, submit to Owner a list of all such Subcontractors, Suppliers, individuals, or entities proposed for those portions of the Work for which such identification is required. Such list shall be accompanied by an experience statement with pertinent information regarding similar projects and other evidence of qualification for each such Subcontractor, Supplier, individual, or entity if requested by Owner. If Owner or Engineer, after due investigation, has reasonable objection to any proposed Subcontractor, Supplier, individual, or entity, Owner may, before the Notice of Award is given, request apparent Successful Bidder to submit a substitute, in which case apparent Successful Bidder shall submit an acceptable substitute, without an increase in Bid.

12.02 If apparent Successful Bidder declines to make any such substitution, Owner may award the Contract to the next lowest Bidder that proposes to use acceptable Subcontractors, Suppliers, individuals, or entities. Declining to make requested substitutions will not constitute grounds for forfeiture of the Bid security of any Bidder. Any Subcontractor, Supplier, individual, or entity so listed and against which Owner or Engineer makes no written objection prior to the giving of the Notice of Award will be deemed acceptable to Owner and Engineer subject to revocation of such acceptance after the Effective Date of the Agreement as provided in Paragraph 6.06 of the General Conditions.

12.03 Contractor shall not be required to employ any Subcontractor, Supplier, individual, or entity against whom Contractor has reasonable objection.

12.04 **There will be a Non-Mandatory Pre-Bid Conference for this project.** The Non-Mandatory Pre-Bid will be held on Wednesday, April 11, 2018 at 10:00 AM at 1309 College Street in the Courthouse Annex Conference Room, Newberry, South Carolina 29108. Each bidder shall fully acquaint himself with conditions of this Bid. The failure or omission of a bidder to acquaint himself with existing conditions shall in no way relieve him of any obligation with respect to this Bid or to the Contract. The deadline for submitting questions is **Wednesday, April 18, 2018** at **5:00 PM.** The questions will be sent to Alliance Consulting Engineers, Inc. to Mr. Steve Whaley at swhaley@alliancece.com, and copied to Newberry Purchasing department to Ms. Crystal Waldrop at cwaldrop@newberrycounty.net. No phone calls will be accepted by the engineer.

ARTICLE 13 - PREPARATION OF BID

13.01 The Bid Form is included with the Bidding Documents. Additional copies may be obtained from Engineer.

13.02 All blanks on the Bid Form shall be completed by printing in ink or by typewriter and the Bid signed in ink. Erasures or alterations shall be initialed in ink by the person signing the Bid Form. A Bid price shall be indicated for each unit price item listed therein, or the words “No Bid,” “No Change,” or “Not Applicable” entered.

13.03 A Bid by a corporation shall be executed in the corporate name by the president, vice-president, or other corporate officer accompanied by evidence of authority to sign. The corporate seal shall be affixed and attested by the secretary or an assistant secretary. The corporate address and state of incorporation shall be shown below the signature.

13.04 A Bid by a partnership shall be executed in the partnership name and signed by a partner (whose title must appear under the signature), accompanied by evidence of authority to sign. The official address of the partnership shall be shown below the signature.

13.05 A Bid by a limited liability company shall be executed in the name of the firm by a member and accompanied by evidence of authority to sign. The state of formation of the firm and the official address of the firm shall be shown below the signature.

13.06 A Bid by an individual shall show the Bidder's name and official address.

13.07 A Bid by a joint venture shall be executed by each joint venturer in the manner indicated on the Bid Form. The official address of the joint venture shall be shown below the signature.

13.08 All names shall be typed or printed in ink below the signatures.

13.09 The Bid shall contain an acknowledgment of receipt of all Addenda, the numbers of which shall be filled in on the Bid Form.

13.10 The postal address and telephone number for communications regarding the Bid shall be shown.

13.11 The Bid shall contain evidence of Bidder's authority and qualification to do business in the state where the Project is located or covenant to obtain such qualification prior to award of the Contract. Bidder's state contractor license number, if any, shall also be shown on the Bid Form.

ARTICLE 14 - BASIS OF BID; COMPARISON OF BIDS

14.01 Unit Price

A. Bidders shall submit a Bid on a unit price basis for each item of Work listed in the Bid schedule.

B. The total of all estimated prices will be the sum of the products of the estimated quantity of each item and the corresponding unit price. The final quantities and Contract Price will be determined in accordance with Paragraph 11.03 of the General Conditions.

C. Discrepancies between the multiplication of units of Work and unit prices will be resolved in favor of the unit prices. Discrepancies between the indicated sum of any column of figures and the correct sum thereof will be resolved in favor of the correct sum. Discrepancies between words and figures will be resolved in favor of the words.

14.02 The Bid price shall include such amounts as the Bidder deems proper for overhead and profit on account of cash allowances, if any, named in the Contract Documents as provided in Paragraph 11.02 of the General Conditions.

ARTICLE 15 - SUBMITTAL OF BID

15.01 With each copy of the Bidding Documents, a Bidder is furnished one (1) separate unbound copy of the Bid Form, and, if required, the Bid Bond Form. The unbound copy of the Bid Form is to be completed and submitted with all the attachments outlined in Article 7 of the Bid Form.

15.02 A Bid shall be submitted no later than the date and time prescribed and at the place indicated in the Advertisement for Bids and shall be enclosed in an opaque sealed envelope plainly marked with the Project title (and, if applicable, the designated portion of the Project for which the Bid is submitted), the name and address of Bidder, and shall be accompanied by the Bid security and other required documents. If a Bid is sent by mail or other delivery system, the sealed envelope containing the Bid shall be enclosed in a separate package plainly marked on the outside with the notation "BID ENCLOSED". When using the mail or other delivery system, the Bidder is totally responsible for the

mail or other delivery system delivering the Bid at the place and prior to the time indicated in the Advertisement for Bid. A mailed Bid shall be addressed to Owner at address in Article 1.01 of Bid Form.

ARTICLE 16 - MODIFICATION AND WITHDRAWAL OF BID

16.01 A Bid may be modified or withdrawn by an appropriate document duly executed in the manner that a Bid must be executed and delivered to the place where Bids are to be submitted prior to the date and time for the opening of Bids.

16.02 If within 24 hours after Bids are opened any Bidder files a duly signed written notice with Owner and promptly thereafter demonstrates to the reasonable satisfaction of Owner that there was a material and substantial mistake in the preparation of its Bid, that Bidder may withdraw its Bid, and the Bid security will be returned. Thereafter, if the Work is rebid or negotiated, that Bidder will be disqualified from further bidding on the work. The provision to withdraw a Bid without forfeiting the Bid security does not apply to Bidder's errors in judgment in preparing the bid.

ARTICLE 17 - OPENING OF BIDS

17.01 Bids will be opened at the time and place indicated in the Advertisement or Invitation to Bid and, unless obviously non-responsive, read aloud publicly. An abstract of the amounts of the base Bids and major alternates, if any, will be made available to Bidders after the opening of Bids in the form of a Bid Tabulation and Bid Comparison. The Bid Opening Minutes will also be provided to all in attendance.

ARTICLE 18 - BIDS TO REMAIN SUBJECT TO ACCEPTANCE

18.01 All Bids will remain subject to acceptance for the period of time stated in the Bid Form, but Owner may, in its sole discretion, release any Bid and return the Bid security prior to the end of this period.

ARTICLE 19 - EVALUATION OF BIDS AND AWARD OF CONTRACT

19.01 Owner reserves the right to reject any or all Bids, including without limitation, nonconforming, non-responsive, unbalanced, or conditional Bids. Owner further reserves the right to reject the Bid of any Bidder whom it finds, after reasonable inquiry and evaluation, to not be responsible. Owner may also reject the Bid of any Bidder if Owner believes that it would not be in the best interest of the Project to make an award to that Bidder. Owner also reserves the right to waive all informalities not involving price, time, or changes in the Work and to negotiate contract terms with the Successful Bidder.

19.02 More than one Bid for the same Work from an individual or entity under the same or different names will not be considered. Reasonable grounds for believing that any Bidder has an interest in more than one Bid for the Work may be cause for disqualification of that Bidder and the rejection of all Bids in which that Bidder has an interest.

19.03 In evaluating Bids, Owner will consider whether or not the Bids comply with the prescribed requirements, and such alternates, unit prices and other data, as may be requested in the Bid Form or prior to the Notice of Award.

19.04 In evaluating Bidders, Owner will consider the qualifications of Bidders and may consider the qualifications and experience of Subcontractors, Suppliers, and other individuals or entities proposed for those portions of the Work for which the identity of Subcontractors, Suppliers, and other individuals or entities must be submitted as provided in the General Conditions.

19.05 Owner may conduct such investigations as Owner deems necessary to establish the responsibility, qualifications, and financial ability of Bidders, proposed Subcontractors, Suppliers, individuals, or entities to perform the Work in accordance with the Contract Documents.

19.06 If the Contract is to be awarded, Owner will award the Contract to the responsible Bidder whose Bid, conforming with all the material terms and conditions of the Instructions to Bidders, is lowest price, and other factors considered. If detailed in the bid form, factors such as discounts, transportation costs, and life cycle costs may be used to determine which bidder, if any, is to be offered award.

19.07 The Owner reserves the right not to Award the Project.

ARTICLE 20 - CONTRACT SECURITY AND INSURANCE

20.01 Article 5 of the General Conditions sets forth Owner's requirements as to performance and payment bonds and insurance. When the Successful Bidder delivers the executed Agreement to Owner, it shall be accompanied by such bonds.

ARTICLE 21 - SIGNING OF AGREEMENT

21.01 When Owner gives a Notice of Intent to Award to the Successful Bidder once Owner/Council has approved for release, it shall be accompanied by the Engineer to issue a Notice of Award after the ten (10) day protest period has expired. The required number of unsigned counterparts of the Agreement to award with the other Contract Documents which are identified in the Agreement as attached thereto. Within ten (10) days thereafter, Successful Bidder shall sign and deliver the required number of counterparts of the Agreement and attached documents to Owner. Within 10 days thereafter, Owner shall deliver one (1) fully signed counterpart to Successful Bidder with a complete set of the Drawings with appropriate identification.

ARTICLE 22 – RETAINAGE

22.01 Retainage from progress payments to the Contractor shall be ten percent (10%) of each payment for work completed and stored materials on site.

END OF SECTION

SECTION 00 41 00
BID FORM

The City of Newberry Recreational Complex on Approximately 200-Acres along SC Highway 34 For the City of Newberry

IN

NEWBERRY COUNTY, SOUTH CAROLINA
BID DOCUMENT NO.: 2018-05

TABLE OF ARTICLES

ARTICLE 1 - BID RECIPIENT

1.01 This Bid is submitted to:

Newberry County
P.O. Box 156 (Mailing Address)
1309 College Street (Physical Address)
Newberry, SC 29108

1.02 Bids are to be delivered to:

Newberry County
Ms. Crystal Waldrop, Purchasing Director
P.O. Box 156 (Mailing Address)
1309 College Street (Physical Address)
Newberry, SC 29108

1.03 The undersigned Bidder proposes and agrees, if this Bid is accepted, to enter into an Agreement with Owner in the form included in the Bidding Documents to perform all Work as specified or indicated in the Bidding Documents for the prices and within the times indicated in this Bid and in accordance with the other terms and conditions of the Bidding Documents.

ARTICLE 2 - BIDDER'S ACKNOWLEDGEMENTS

2.01 Bidder accepts all of the terms and conditions of the Instructions to Bidders, including without limitation those dealing with the disposition of Bid security. This Bid will remain subject to acceptance for sixty (60) days after the Bid opening, or for such longer period of time that Bidder may agree to in writing upon request of Owner.

ARTICLE 3 - BIDDER'S REPRESENTATIONS

3.01 In submitting this Bid, Bidder represents that:

F. Bidder has examined and carefully studied the Bidding Documents, the other related data identified in the Bidding Documents, and the following Addenda, receipt of which is hereby acknowledged.

Addendum No.	Addendum Date	Initials
_____	_____	_____
_____	_____	_____
_____	_____	_____

G. Bidder has visited the Site and become familiar with and is satisfied as to the general, local and Site conditions that may affect cost, progress, and performance of the Work.

H. Bidder is familiar with and is satisfied as to all federal, state and local Laws and Regulations that may affect cost, progress and performance of the Work.

I. Bidder has carefully studied all: (1) reports of explorations and tests of subsurface conditions at or contiguous to the Site and all drawings of physical conditions in or relating to existing surface or subsurface structures at or contiguous to the Site (except Underground Facilities), which have been identified in Paragraph 4.02 of General Conditions, and (2) reports and drawings of Hazardous Environmental Conditions that have been identified in Paragraph 4.06 of General Conditions.

J. Bidder has obtained and carefully studied (or accepts the consequences for not doing so) all additional or supplementary examinations, investigations, explorations, tests, studies and data concerning conditions (surface, subsurface and Underground Facilities) at or contiguous to the Site, which may affect cost, progress, or performance of the Work or which relate to any aspect of the means, methods, techniques, sequences, and procedures of construction to be employed by Bidder, including applying the specific means, methods, techniques, sequences, and procedures of construction expressly required by the Bidding Documents to be employed by Bidder, and safety precautions and programs incident thereto.

K. Bidder does not consider that any further examinations, investigations, explorations, tests, studies, or data are necessary for the determination of this Bid for performance of the Work at the price(s) bid and within the times and in accordance with the other terms and conditions of the Bidding Documents.

L. Bidder is aware of the general nature of work to be performed by Owner and others at the Site that relates to the Work as indicated in the Bidding Documents.

M. Bidder has correlated the information known to Bidder, information and observations obtained from visits to the Site, reports and drawings identified in the Bidding Documents, and all additional examinations, investigations, explorations, tests, studies, and data with the Bidding Documents.

N. Bidder has given Engineer written notice of all conflicts, errors, ambiguities, or discrepancies that Bidder has discovered in the Bidding Documents, and the written resolution thereof by Engineer is acceptable to Bidder.

O. The Bidding Documents are generally sufficient to indicate and convey understanding of all terms and conditions for the performance of the Work for which this Bid is submitted.

P. Bidder will submit written evidence of its authority to do business in the state where the Project is located not later than the date of its execution of the Agreement.

ARTICLE 4 - FURTHER REPRESENTATIONS

4.01 Bidder further represents that:

A. This Bid is genuine and not made in the interest of or on behalf of any undisclosed individual or entity and is not submitted in conformity with any agreement or rules of any group, association, organization or corporation.

B. Bidder has not directly or indirectly induced or solicited any other Bidder to submit a false or sham Bid.

C. Bidder has not solicited or induced any individual or entity to refrain from bidding.

D. Bidder has not sought by collusion to obtain for itself any advantage over any other Bidder or over Owner.

ARTICLE 5 - BASIS OF BID

5.01 Bidder will complete the Work in accordance with the Contract Documents for the following unit price(s):

The City of Newberry Recreational Complex on Approximately 200-Acres along SC Highway 34 for the City of Newberry in Newberry County, South Carolina

Item No.	Description	Unit	Estimated Quantity	Unit Price	Bid Price
1	Mobilization/Bonds	LS	1	$	$
2	Clearing and Grubbing	AC	43	$	$
3	Temporary Construction Entrance	EA	1	$	$
4	Silt Fence	LF	7,300	$	$
5	Sediment Tubes	EA	65	$	$
6	SC150 Erosion Control Matting in Channels	SY	30,500	$	$
7	SC250 Erosion Control Matting on Slopes	SY	11,300	$	$
8	Rip-Rap Outlet/Inlet Protection	SY	90	$	$
9	Outlet Riser Structure	EA	3	$	$
10	Skimmer with Temporary Transition Pipe Connection	EA	4	$	$
11	8-inch Skimmer with Temporary Aluminum Riser cap for Existing Pond Riser	EA	1	$	$
12	Silt Baffles	LF	700	$	$
13	Rip-Rap in Earthen Baffle and Emergency Spillway	SY	525	$	$
14	Earthwork (General Excavation/Backfill/Compaction)	LS	1	$	$
15	Yard Inlet (Concrete Structure Type 9) - Two (2) feet to fifteen (15) feet deep	EA	25	$	$
16	Drop Inlet (Concrete Structure 24-inch x 24-inch) - Nine (9) to 11 feet deep	EA	2	$	$
17	Junction Box (Concrete Structure) - Three (3) to 14 feet deep	EA	12	$	$
18	12-inch Catch Basin (ADS Structure in slopes) - Three (3) to six (6) feet deep	EA	13	$	$
19	18-inch Catch Basin (ADS Structure in slopes) - Six (6) feet deep	EA	1	$	$
20	12-inch RCP - Class III (1 foot to 9 feet deep)	LF	640	$	$
21	18-inch RCP - Class III (1 foot to 11 feet deep)	LF	1,400	$	$
22	24-inch RCP - Class III (1 foot to 11 feet deep)	LF	865	$	$
23	36-inch RCP - Class III (3 feet to 10 feet deep)	LF	555	$	$
24	12-inch Single Wall HDPE Pipe (1 foot to 5 feet deep)	LF	450	$	$
25	18-inch Single Wall HDPE Pipe (2 feet to 11 feet deep)	LF	190	$	$
26	24-inch Single Wall HDPE Pipe (3 feet to 4 feet deep)	LF	415	$	$
27	36-inch Single Wall HDPE Pipe (5 feet to 12 feet deep)	LF	465	$	$
28	Inlet Protection	EA	22	$	$
29	1 1/2-inch Asphalt Surface Course (Type C)	SY	12,300	$	$

30	1 1/2-inch Asphalt Intermediate Binder Course (Type C)	SY	12,300	$	$
31	8 1/2-inch Graded Aggregate Base Course	SY	12,300	$	$
32	Roadway Centerline Striping (Double Yellow)	LF	2,965	$	$
33	24-inch Solid White Stop Bar	EA	4	$	$
34	Signage	LS	1	$	$
35	8 1/2-inch Graded Aggregate Base Course	SY	9,330	$	$
36	2 1/2-inch Asphalt Surface Course (Type C)	SY	9,330	$	$
37	Signage (ADA & Stop)	LS	1	$	$
38	Striping (Solid White)	LF	6,480	$	$
39	4-inch Concrete Pavement (6-foot Sidewalk)	SY	760	$	$
40	4-inch Concrete Pavement (9-foot Sidewalk)	SY	305	$	$
41	4-inch Concrete Pavement (12-foot Sidewalk)	SY	2,480	$	$
42	Concrete Wheel Stops	EA	10	$	$
43	Concrete Ramp	SY	200	$	$
44	Metal Handrail	LF	475	$	$
45	Concrete Stairs	LS	1	$	$
46	Wood Chip Mulch (8-ft wide)	SY	2,455	$	$
47	Post and Cable Fence along Northern Field Edge and Walking Trail	LF	1,155	$	$
48	Park Benches	EA	6	$	$
49	Entrance Sign (5-foot by 3-foot Masonry)	LS	1	$	$
50	Southern Live Oak Tree	EA	7	$	$
51	Armstrong Maple Tree	EA	10	$	$
52	Kaleidoscope Abelia Shrub	EA	14	$	$
53	Nellie Stevens Holly Shrub	EA	2	$	$
54	Dwarf Chinese Holly Shrub	EA	4	$	$
55	Natchez Crape Myrtle Tree	EA	18	$	$
56	Mulch for Landscaping	SY	60	$	$
57	Permanent Grassing	AC	28.5	$	$
58	Chain-link Perimeter Fencing (6-feet high)	LF	2,010	$	$
59	Chain-link Foul Line Fencing (10-feet high)	LF	400	$	$
60	Chain-link Backstop (16-feet high)	LF	200	$	$
61	Double 6-foot Gate	EA	2	$	$
62	6-foot by 20-foot Dugout (Metal Roof Shed and Benches)	EA	4	$	$
63	Bleachers	EA	4	$	$
64	Lighting System (Two (2) Multipurpose and Two (2) Baseball Fields)	LS	4	$	$
65	Clay Import for Baseball Diamond Area	CY	1,825	$	$
66	Select Import Topsoil (Two (2) Multipurpose and Two (2) Baseball Fields)	CY	6,735	$	$
Total Base Bid:				$	

Total Bid in Words

_____Dollars _____Cents

($_____)

Upon the receipt of the bids, Newberry County shall review the bids received and determine the scope of work for this project based on the available budget for the project. The contract for this project shall be awarded to the low bidder for the project scope as determined by the sum total of the base bid portion or the combined sum of the base bid and approved base bid alternates depending on the scope of the project selected.

The above unit prices shall include all labor, materials, bailing, shoring, removal, overhead, profit, insurance, etc., to complete the finish work as stipulated in the Bid Documents.

Unit Prices have been computed in accordance with Paragraph 11.03.B of the General Conditions.

A. Bidder acknowledges that estimated quantities are not guaranteed and are solely for the purpose of comparison of Bids, and final payment for all Unit Price Bid items will be based on actual quantities, determined as provided in the Contract Documents.

5.02 Base Bid Alternate No. 1 - Bidder will complete the Work in accordance with the Contract Documents for the following unit price(s):

Water System for the City of Newberry Recreational Complex on Approximately 200-Acres along SC Highway 34 for the City of Newberry in Newberry County, South Carolina

Item No.	Description	Unit	Estimated Quantity	Unit Price	Bid Price
1	Mobilization/Bonds	LS	1	$	$
2	16x6-inch Tapping Sleeve Connection	EA	1	$	$
3	6-inch PVC Watermain	LF	1,790	$	$
4	6-inch Pressure Reducer Valve and Manhole	EA	1	$	$
5	6-inch Gate Valve	EA	2	$	$
6	6-inch Tee	EA	1	$	$
7	6-inch Plug w/ blocking	EA	1	$	$
8	Fire Hydrant Assembly and Appurtenances	EA	1	$	$
9	2-inch Sch 40 PVC Watermain	LF	1,160	$	$
10	2-inch Meter	EA	1	$	$
11	2-inch Backflow Unit	EA	1	$	$
12	Vault for Meter and Backflow Preventer	EA	2	$	$
13	2-inch Gate Valve	EA	2	$	$
14	2-inch 90 Degree Bend	EA	3	$	$
15	2-inch 45 Degree Bend	EA	2	$	$

Total Base Bid Alternate 1:	$

Total Base Bid Alternate 1 in Words

_____Dollars _____Cents

($_____)

Upon the receipt of the bids, Newberry County shall review the bids received and determine the scope of work for this project based on the available budget for the project. The contract for this project shall be awarded to the low bidder for the project scope as determined by the sum total of the base bid portion or

the combined sum of the base bid and approved base bid alternates depending on the scope of the project selected.

The above unit prices shall include all labor, materials, bailing, shoring, removal, overhead, profit, insurance, etc., to complete the finish work as stipulated in the Bid Documents.

Unit Prices have been computed in accordance with Paragraph 11.03.B of the General Conditions.

Upon the receipt of the bids, Newberry County shall review the bids received and determine the scope of work for this project based on the available budget for the project. The contract for this project shall be awarded to the low bidder for the project scope as determined by the sum total of the base bid portion or the combined sum of the base bid and approved base bid alternates depending on the scope of the project selected.

The above unit prices shall include all labor, materials, bailing, shoring, removal, overhead, profit, insurance, etc., to complete the finish work as stipulated in the Bid Documents.

Unit Prices have been computed in accordance with Paragraph 11.03.B of the General Conditions

A. Bidder acknowledges that estimated quantities are not guaranteed, and are solely for the purpose of comparison of Bids, and final payment for all Unit Price Bid items will be based on actual quantities, determined as provided in the Contract Documents.

5.03 Base Bid Alternate No. 2 - Bidder will complete the Work in accordance with the Contract Documents for the following unit price(s):

Wastewater System for the City of Newberry Recreational Complex on Approximately 200-Acres along SC Highway 34 for the City of Newberry in Newberry County, South Carolina

Item No.	Description	Unit	Estimated Quantity	Unit Price	Bid Price
1	Mobilization/Bonds	LS	1	$	$
2	6-inch PVC Gravity Wastewater (5 - 6 feet deep)	LF	205	$	$
3	8-inch PVC Gravity Wastewater (5 - 6 feet deep)	LF	442	$	$
4	Manhole (5 - 6 feet deep)	EA	2	$	$
5	4-inch PVC Wastewater Forcemain	LF	4,655	$	$
6	4x8 Increase in Forcemain	EA	1	$	$
7	8-inch PVC Wastewater Forcemain	LF	20	$	$
8	175 GPM Wastewater Pump Station (Complete Construction in accordance with City of Newberry County Specifications that include but not limited to the wetwell and valve pit with appurtenances as noted, all pumps and materials for proper operations, all controls systems required to operate the pumps and systems, electrial required to operate the system unless otherwise noted, gravel, water service, one (1) spare pump, three (3) pumps total)	LS	1	$	$
9	Air Relief w/ Manhole	EA	3	$	$

10	4-inch 90 Degree Bend	EA	2	$	$
11	4-inch 45 Degree Bend	EA	3	$	$
12	12-inch Steel Casing for Bore and Jack under Oliver Court and Existing Church Driveway	LF	99	$	$
13	Connection to Existing Manhole	EA	1	$	$
14	Saw Cut and Repair Existing Driveway	EA	5	$	$
15	2-inch Asphatic Concrete Surface for Open Cut Repair at Existing Driveways (Type D for Low Volume Driveway)	SY	335	$	$
16	8-inch Stabilized ABC for Open Cut Repair at Existing Driveways (Type D for Low Volume Driveway)	SY	335	$	$
17	4-inch Concrete Pavement for Pump Station Pad	SY	20	$	$
Total Base Bid Alternate 2:				$	

Total Base Bid Alternate 2 in Words

_____Dollars _____Cents

($_____)

Upon the receipt of the bids, Newberry County shall review the bids received and determine the scope of work for this project based on the available budget for the project. The contract for this project shall be awarded to the low bidder for the project scope as determined by the sum total of the base bid portion or the combined sum of the base bid and approved base bid alternates depending on the scope of the project selected.

The above unit prices shall include all labor, materials, bailing, shoring, removal, overhead, profit, insurance, etc., to complete the finish work as stipulated in the Bid Documents.

Unit Prices have been computed in accordance with Paragraph 11.03.B of the General Conditions.

Upon the receipt of the bids, Newberry County shall review the bids received and determine the scope of work for this project based on the available budget for the project. The contract for this project shall be awarded to the low bidder for the project scope as determined by the sum total of the base bid portion or the combined sum of the base bid and approved base bid alternates depending on the scope of the project selected.

The above unit prices shall include all labor, materials, bailing, shoring, removal, overhead, profit, insurance, etc., to complete the finish work as stipulated in the Bid Documents.

Unit Prices have been computed in accordance with Paragraph 11.03.B of the General Conditions

A. Bidder acknowledges that estimated quantities are not guaranteed, and are solely for the purpose of comparison of Bids, and final payment for all Unit Price Bid items will be based on actual quantities, determined as provided in the Contract Documents.

5.04 Base Bid Alternate No. 3 - Bidder will complete the Work in accordance with the Contract Documents for the following unit price(s):

Irrigation System for the City of Newberry Recreational Complex on Approximately 200-Acres along SC Highway 34 for the City of Newberry in Newberry County, South Carolina					
Item No.	Description	Unit	Estimated Quantity	Unit Price	Bid Price
1	Mobilization/Bonds	LS	1	$	$
2	Irrigation System and Pump System	LS	1	$	$
3	Fiberglass Enclosure over Pump Unit	EA	1	$	$
4	Electrical Service and Control Panel	EA	1	$	$
5	6-inch Perforated French Drain and Wash Stone	LF	3,920	$	$
Total Base Bid Alternate 3:				$	

Total Base Bid Alternate 3 in Words

_____Dollars _____Cents

($_____)

Upon the receipt of the bids, Newberry County shall review the bids received and determine the scope of work for this project based on the available budget for the project. The contract for this project shall be awarded to the low bidder for the project scope as determined by the sum total of the base bid portion or the combined sum of the base bid and approved base bid alternates depending on the scope of the project selected.

The above unit prices shall include all labor, materials, bailing, shoring, removal, overhead, profit, insurance, etc., to complete the finish work as stipulated in the Bid Documents.

Unit Prices have been computed in accordance with Paragraph 11.03.B of the General Conditions.

Upon the receipt of the bids, Newberry County shall review the bids received and determine the scope of work for this project based on the available budget for the project. The contract for this project shall be awarded to the low bidder for the project scope as determined by the sum total of the base bid portion or the combined sum of the base bid and approved base bid alternates depending on the scope of the project selected.

The above unit prices shall include all labor, materials, bailing, shoring, removal, overhead, profit, insurance, etc., to complete the finish work as stipulated in the Bid Documents.

Unit Prices have been computed in accordance with Paragraph 11.03.B of the General Conditions

A. Bidder acknowledges that estimated quantities are not guaranteed, and are solely for the purpose of comparison of Bids, and final payment for all Unit Price Bid items will be based on actual quantities, determined as provided in the Contract Documents.

5.05 Base Bid Alternate No. 4 - Bidder will complete the Work in accordance with the Contract Documents for the following unit price(s):

GABC Access Drive and Parking Area for the City of Newberry Recreational Complex on Approximately 200-Acres along SC Highway 34 for the City of Newberry in Newberry County, South Carolina

Item No.	Description	Unit	Estimated Quantity	Unit Price	Bid Price
1	Mobilization/Bonds	LS	1	$	$
2	4-inch GABC Stone Access Drives and Parking	SY	1,100	$	$
Total Base Bid Alternate 4:				$	

Total Base Bid Alternate 4 in Words

_____Dollars _____Cents

($_____)

Upon the receipt of the bids, Newberry County shall review the bids received and determine the scope of work for this project based on the available budget for the project. The contract for this project shall be awarded to the low bidder for the project scope as determined by the sum total of the base bid portion or the combined sum of the base bid and approved base bid alternates depending on the scope of the project selected.

The above unit prices shall include all labor, materials, bailing, shoring, removal, overhead, profit, insurance, etc., to complete the finish work as stipulated in the Bid Documents.

Unit Prices have been computed in accordance with Paragraph 11.03.B of the General Conditions.

Upon the receipt of the bids, Newberry County shall review the bids received and determine the scope of work for this project based on the available budget for the project. The contract for this project shall be awarded to the low bidder for the project scope as determined by the sum total of the base bid portion or the combined sum of the base bid and approved base bid alternates depending on the scope of the project selected.

The above unit prices shall include all labor, materials, bailing, shoring, removal, overhead, profit, insurance, etc., to complete the finish work as stipulated in the Bid Documents.

Unit Prices have been computed in accordance with Paragraph 11.03.B of the General Conditions

A. Bidder acknowledges that estimated quantities are not guaranteed, and are solely for the purpose of comparison of Bids, and final payment for all Unit Price Bid items will be based on actual quantities, determined as provided in the Contract Documents.

5.06 Base Bid Alternate No. 5 - Bidder will complete the Work in accordance with the Contract Documents for the following unit price(s):

One (1) Additional Baseball Field for the City of Newberry Recreational Complex on Approximately 200-Acres along SC Highway 34 for the City of Newberry in Newberry County, South Carolina					
Item No.	Description	Unit	Estimated Quantity	Unit Price	Bid Price
1	Mobilization/Bonds	LS	1	$	$
2	Chain-link Perimeter Fencing (6-feet high)	LF	1,000	$	$
3	Chain-link Foul Line Fencing (10-feet high)	LF	200	$	$
4	Chain-link Backstop (16-feet high)	LF	100	$	$
5	Double 6-foot Gate	EA	1	$	$
6	6-foot by 20-foot Dugout (Metal Roof Shed and Benches)	EA	2	$	$
7	Bleachers	EA	2	$	$
8	Lighting System	LS	1	$	$
9	6-inch Perforated French Drain and Wash Stone Underdrain system	LF	1,135	$	$
10	Clay Import for Baseline Diamond Area	CY	915	$	$
11	Select Import Topsoil	CY	2,370	$	$
Total Base Bid Alternate 5:				$	

Total Base Bid Alternate 5 in Words

_____Dollars _____Cents

($_____)

Upon the receipt of the bids, Newberry County shall review the bids received and determine the scope of work for this project based on the available budget for the project. The contract for this project shall be awarded to the low bidder for the project scope as determined by the sum total of the base bid portion or the combined sum of the base bid and approved base bid alternates depending on the scope of the project selected.

The above unit prices shall include all labor, materials, bailing, shoring, removal, overhead, profit, insurance, etc., to complete the finish work as stipulated in the Bid Documents.

Unit Prices have been computed in accordance with Paragraph 11.03.B of the General Conditions.

Upon the receipt of the bids, Newberry County shall review the bids received and determine the scope of work for this project based on the available budget for the project. The contract for this project shall be awarded to the low bidder for the project scope as determined by the sum total of the base bid portion or the combined sum of the base bid and approved base bid alternates depending on the scope of the project selected.

The above unit prices shall include all labor, materials, bailing, shoring, removal, overhead, profit, insurance, etc., to complete the finish work as stipulated in the Bid Documents.

Unit Prices have been computed in accordance with Paragraph 11.03.B of the General Conditions

A. Bidder acknowledges that estimated quantities are not guaranteed, and are solely for the purpose of comparison of Bids, and final payment for all Unit Price Bid items will be based on actual quantities, determined as provided in the Contract Documents.

5.07 Base Bid Alternate No. 6 - Bidder will complete the Work in accordance with the Contract Documents for the following unit price(s):

Primary Electrical and Street Lighting Conduit for the City of Newberry Recreational Complex on Approximately 200-Acres along SC Highway 34 for the City of Newberry in Newberry County, South					
Item No.	Description	Unit	Estimated Quantity	Unit Price	Bid Price
1	Mobilization/Bonds	LF	1	$	$
2	2-inch PVC Conduit, Sch. 40	EA	50,500	$	$
3	2-inch PVC, 90° Elbow, Sch. 40	EA	230	$	$
4	2-inch PVC Coupling	EA	230	$	$
5	4-inch PVC Conduit, Sch. 40	LF	400	$	$
6	4-inch PVC, 90° Elbow, Sch. 40	EA	10	$	$
7	4-inch PVC Coupling	EA	10	$	$
8	Cement (Non-metallic Conduit)	CY	10	$	$
9	Pencell Secondary Enclosure	LF	55	$	$
10	Marker Tape/Ditch Tape (Red Electric Line Below)	EA	12	$	$
11	2-inch PVC End Caps	EA	10	$	$
12	4-inch PVC End Caps	EA	6	$	$
Total Base Bid Alternate 6:				$	

Total Base Bid Alternate 6 in Words

_____Dollars _____Cents

($_____)

Upon the receipt of the bids, Newberry County shall review the bids received and determine the scope of work for this project based on the available budget for the project. The contract for this project shall be awarded to the low bidder for the project scope as determined by the sum total of the base bid portion or the combined sum of the base bid and approved base bid alternates depending on the scope of the project selected.

The above unit prices shall include all labor, materials, bailing, shoring, removal, overhead, profit, insurance, etc., to complete the finish work as stipulated in the Bid Documents.

Unit Prices have been computed in accordance with Paragraph 11.03.B of the General Conditions.

Upon the receipt of the bids, Newberry County shall review the bids received and determine the scope of work for this project based on the available budget for the project. The contract for this project shall be awarded to the low bidder for the project scope as determined by the sum total of the base bid portion or the combined sum of the base bid and approved base bid alternates depending on the scope of the project selected.

The above unit prices shall include all labor, materials, bailing, shoring, removal, overhead, profit, insurance, etc., to complete the finish work as stipulated in the Bid Documents.

Unit Prices have been computed in accordance with Paragraph 11.03.B of the General Conditions

A. Bidder acknowledges that estimated quantities are not guaranteed, and are solely for the purpose of comparison of Bids, and final payment for all Unit Price Bid items will be based on actual quantities, determined as provided in the Contract Documents.

ARTICLE 6 - TIME OF COMPLETION

6.01 The City of Newberry Recreational Complex on Approximately 200-Acres along SC Highway 34 for the City of Newberry in unincorporated Newberry County, South Carolina will be completed within two hundred seventy (270) calendar days after the Notice to Proceed has been issued.

6.02 Bidder accepts the provisions of the Agreement as to liquidated damages in the event of failure to complete the Work within the Contract dates in the amount of $500 per day for the site for each calendar day required to complete the work in the manner and within the dates as stated in Paragraph 6.01 above.

ARTICLE 7 - ATTACHMENTS TO THIS BID

7.01 The following documents are attached to and made a condition of this Bid:

A. Required Bid security in the form of five percent (5%) of the total bid amount.

B. Power of Attorney.

ARTICLE 8 - DEFINED TERMS

8.01 The terms used in this Bid with initial capital letters have the meanings stated in the Instructions to Bidders and General Conditions.

ARTICLE 9 - BID SUBMITTAL

9.01 This Bid submitted by:

An Individual

Name (typed or printed): _____

By: _____ (SEAL)

(Individual's signature)

Title: _____

Doing business as: _____

A Partnership

Partnership Name: _____ (SEAL)

By:

(Signature of general partner -- attach evidence of authority to sign)

Title: _____

Name (typed or printed): _____

A Corporation

Corporation Name: _____ (SEAL)
State of Incorporation: _____
Type (General Business, Professional, Service, Limited Liability):_____
By:
(Signature -- attach evidence of authority to sign)
Name (typed or printed): _____
Title: _____(CORPORATE SEAL)
Attest _____
Date of Authorization to do business in *[South Carolina]* is / / .

A Joint Venture

Name of Joint Venture: _____
First Joint Venturer Name: _____ (SEAL)
By:
(Signature of first joint venture partner -- attach evidence of authority to sign)
Name (typed or printed): _____
Title:
Second Joint Venturer Name: _____ (SEAL)

By: _____
(Signature of second joint venture partner -- attach evidence of authority to sign)
Name (typed or printed): _____
Title: _____

(Each joint venturer must sign. The manner of signing for each individual, partnership, and corporation that is a party to the joint venture should be in the manner indicated above.)

Bidder's Business Address _____

Telephone No. _____ Fax No. _____

SUBMITTED on _____, 2018. State Contractor License No. _____.

END OF SECTION

SECTION 00 43 00

BID BOND

Any singular reference to Bidder, Surety, Owner, or other party shall be considered plural where applicable.

BIDDER (Name and Address):

SURETY (Name and Address of Principal Place of Business):

OWNER (Name and Address): **Newberry County**
P.O. Box 156; 1309 College Street
Newberry, South Carolina, 29108

BID
Bid Due Date: _____

Project (Brief Description Including Location): **The City of Newberry Recreational Complex on Approximately 200-Acres along SC Highway 34 for the City of Newberry, in Newberry County South Carolina**

BOND
Bond Number:
Date (Not later than Bid due date):
Penal sum _____ _____
(Words) (Figures)

Surety and Bidder, intending to be legally bound hereby, subject to the terms printed on the reverse side hereof, do each cause this Bid Bond to be duly executed on its behalf by its authorized officer, agent, or representative.

BIDDER	SURETY
_____ (Seal)	_____ (Seal)
Bidder's Name and Corporate Seal	Surety's Name and Corporate Seal
By: _____	By: _____
Signature and Title	Signature and Title (Attach Power of Attorney)
Attest: _____	Attest: _____
Signature and Title	Signature and Title

Note: Above addresses are to be used for giving required notice.

1. Bidder and Surety, jointly and severally, bind themselves, their heirs, executors, administrators, successors and assigns to pay to Owner upon default of Bidder the penal sum set forth on the face of this Bond. Payment of the penal sum is the extent of Surety's liability.

2. Default of Bidder shall occur upon the failure of Bidder to deliver within the time required by the Bidding Documents (or any extension thereof agreed to in writing by Owner) the executed Agreement required by the Bidding Documents and any performance and payment bonds required by the Bidding Documents.

3. This obligation shall be null and void if:
   3.1. Owner accepts Bidder's Bid and Bidder delivers within the time required by the Bidding Documents (or any extension thereof agreed to in writing by Owner) the executed Agreement required by the Bidding Documents and any performance and payment bonds required by the Bidding Documents, or
   3.2. All Bids are rejected by Owner, or
   3.3. Owner fails to issue a Notice of Award to Bidder within the time specified in the Bidding Documents (or any extension thereof agreed to in writing by Bidder and, if applicable, consented to by Surety when required by Paragraph 5 hereof).

4. Payment under this Bond will be due and payable upon default by Bidder and within 30 calendar days after receipt by Bidder and Surety of written notice of default from Owner, which notice will be given with reasonable promptness, identifying this Bond and the Project and including a statement of the amount due.

5. Surety waives notice of any and all defenses based on or arising out of any time extension to issue Notice of Award agreed to in writing by Owner and Bidder, provided that the total time for issuing Notice of Award including extensions shall not in the aggregate exceed 120 days from Bid due date without Surety's written consent.

6. No suit or action shall be commenced under this Bond prior to 30 calendar days after the notice of default required in Paragraph 4 above is received by Bidder and Surety and in no case later than one year after Bid due date.

7. Any suit or action under this Bond shall be commenced only in a court of competent jurisdiction located in the state in which the Project is located.

8. Notices required hereunder shall be in writing and sent to Bidder and Surety at their respective addresses shown on the face of this Bond. Such notices may be sent by personal delivery, commercial courier, or by United States Registered or Certified Mail, return receipt requested, postage pre-paid, and shall be deemed to be effective upon receipt by the party concerned.

9. Surety shall cause to be attached to this Bond a current and effective Power of Attorney evidencing the authority of the officer, agent, or representative who executed this Bond on behalf of Surety to execute, seal, and deliver such Bond and bind the Surety thereby.

10. This Bond is intended to conform to all applicable statutory requirements. Any applicable requirement of any applicable statute that has been omitted from this Bond shall be deemed to be included herein as if set forth at length. If any provision of this Bond conflicts with any applicable statute, then the provision of said statute shall govern and the remainder of this Bond that is not in conflict therewith shall continue in full force and effect.

11. The term "Bid" as used herein includes a Bid, offer, or proposal as applicable.

SECTION 00 45 13

CONTRACTOR/SUBCONTRACTOR QUALIFICATIONS

PART 1 - GENERAL

1.01 The following information and completed forms may be requested by the Owner of the three lowest bidders. The request will be made the day of the Bid Opening or within five (5) days following the Bid Opening. If requested, this data must be submitted to the Engineer or Owner within ten (10) days of the request. Failure to provide the data in this section, upon request, will subject bidder to disqualification.

1.02 DESCRIPTION

A. Information provided will be used by the Engineer or Owner to determine the competency and ability of the Contractor and/or Subcontractor to perform the scheduled work in a manner that is satisfactory to the Engineer or Owner. The Engineer or Owner's decision shall be final.

B. Any Subcontractor being used by the General Contractor, whose portion of the project exceeds 5% of the total bid price amount, will be required to provide the same information as the General Contractor.

C. The Contractor and Subcontractor shall include with this section a detailed financial statement indicating the Contractor's or Subcontractor's financial resources. The information on that statement shall be certified by a Certified Public Accountant and shall be submitted on the Associated General Contractor's of America form "Standard Questionnaires and Financial Statement for Bidders".

D. The Contractor and Subcontractor shall certify by attaching his signature to this Section as provided that all information contained herein is complete and all statements and answers are accurate and true. Providing misinformation, incomplete information, inaccurate information, or failure to certify the information, will subject bidder to disqualification.

1.03 QUALIFICATIONS

A. Complete the following for General Contractor and any Subcontractors (attach additional sheets as required):

1. Name: _____
2. Address: _____
3. City, State, Zip: _____
4. Principle: _____

B. Number of years the company has been is business:

C. List and describe at least five (5) projects that have been completed, that are similar in size and type, and that has been completed within the last ten (10) years:

1. _____

   _____

2. _____

   _____

3. _____

_____

4. _____

_____

5. _____

_____

D. For the projects listed above provide the following:

1. Project Owner: _____
   Contact Name and Title: _____
   Telephone Number: _____

2. Project Owner: _____
   Contact Name and Title: _____
   Telephone Number: _____

3. Project Owner: _____
   Contact Name and Title: _____
   Telephone Number: _____

4. Project Owner: _____
   Contact Name and Title: _____
   Telephone Number: _____

5. Project Owner: _____
   Contact Name and Title: _____
   Telephone Number: _____

E. For each of the projects listed in Items C & D provide the following:

1. Original Bid Amount: _____
   Final Construction Cost: _____
   Contract Period: _____
   Actual Contract Period: _____
   Explanation: _____

2. Original Bid Amount: _____
   Final Construction Cost: _____
   Contract Period: _____
   Actual Contract Period: _____
   Explanation: _____

3. Original Bid Amount: _____
   Final Construction Cost: _____
   Contract Period: _____
   Actual Contract Period: _____
   Explanation: _____

4. Original Bid Amount: _____
   Final Construction Cost: _____
   Contract Period: _____
   Actual Contract Period: _____
   Explanation: _____

5. Original Bid Amount: _____
   Final Construction Cost: _____
   Contract Period: _____
   Actual Contract Period: _____
   Explanation: _____

F. Provide the following for any portion of the work that is being subcontracted (5% or more of the Bid Amount):

1. Name of Subcontractor: _____
   Address: _____
   Telephone Number: _____
   Work being Completed: _____

2. Name of Subcontractor: _____
   Address City/State/Zip: _____
   Telephone Number: _____
   Work being Completed: _____

3. Name of Subcontractor: _____
   Address City/State/Zip: _____
   Telephone Number: _____
   Work being Completed: _____

4. Name of Subcontractor: _____
   Address City/State/Zip: _____
   Telephone Number: _____
   Work being Completed: _____

5. Name of Subcontractor: _____
   Address City/State/Zip: _____
   Telephone Number: _____
   Work being Completed: _____

G. Provide a list of equipment that is owned by the Contractor and is available for this project.

_____

_____

H. Provide a list of equipment that will be purchased, leased or rented for this project.

_____

_____

I. Provide a list of the superintendent(s) or others that will be in charge of this project (Provide resumes and qualifications):

_____

_____

_____

_____

J. Provide the following for current projects being completed:

1. Project Name: _____
   Owner: _____
   Current Status: _____
   Estimated Schedule of Completion: _____

2. Project Name: _____
   Owner: _____
   Current Status: _____
   Estimated Schedule of Completion: _____

SECTION 00 51 02

NOTICE OF AWARD

Dated _____

Project: **The City of Newberry Recreational Complex on Approximately 200-Acres along SC Highway 34 for the City of Newberry in Newberry County, South Carolina**	Owner: **Newberry County**	Owner's Contract No.: **2018-05**
Contract: **The City of Newberry Recreational Complex on Approximately 200-Acres along SC Highway 34 for the City of Newberry in Newberry County, South Carolina**		Engineer's Project No.: **17125-0036**

Bidder:

Bidder's Address: (send Certified Mail, Return Receipt Requested):

You are notified that your Bid dated _____ for the above Contract has been considered. You are the Successful Bidder and are awarded a Contract for **The City of Newberry Recreational Complex on Approximately 200-Acres along SC Highway 34 for the City of Newberry in Newberry County, South Carolina**

The Contract Price of your Contract is: _____

___ copies of each of the proposed Contract Documents (except Drawings) accompany this Notice of Award.

___ sets of the Drawings will be delivered separately or otherwise made available to you immediately.

You must comply with the following conditions precedent within seven (7) days of the date you receive this Notice of Award.

1. Deliver to the Owner six (6) fully executed counterparts of the Contract Documents.

2. Deliver with the executed Contract Documents the Contract security [Bonds] as specified in the Instructions to Bidders (Article 20), [and] General Conditions (Paragraph 5.01).

Failure to comply with these conditions within the time specified will entitle Owner to consider you in default, annul this Notice of Award and declare your Bid security forfeited.

Within seven (7) days after you comply with the above conditions, Owner will return to you one (1) fully executed counterpart of the Contract Documents.

Newberry County
Owner

By:_____
Authorized Signature

Wayne Adams, Administrator
Title

Acceptance of Notice

Receipt of the above Notice of Award is hereby acknowledged by _____
This the _____ day of _____, 2018.

_____
Contractor

By:_____
Authorized Signature

_____
Title

Copy to Engineer

SECTION 00 52 00

CONTRACT

THIS AGREEMENT is by and between **Newberry County**

(hereinafter called "Owner") and _____ (hereinafter called "Contractor")

doing business as an **individual/a partnership/a corporation/a joint venture** (strike out inapplicable terms), with its primary office in _____, County of _____, State of **South Carolina**.

Owner and Contractor, in consideration of the mutual covenants set forth herein, agree as follows:

ARTICLE 1 - WORK

1.01 Contractor shall complete all Work as specified or indicated in the Contract Documents. The Work is generally described as follows: **The City of Newberry Recreational Complex on Approximately 200-Acres along SC Highway 34 for the City of Newberry in Newberry County, South Carolina**

ARTICLE 2 - THE PROJECT

2.01 The Project for which the Work under the Contract Documents may be the whole or only a part is generally described as follows: **The City of Newberry Recreational Complex on Approximately 200-Acres along SC Highway 34 for the City of Newberry in Newberry County, South Carolina**

ARTICLE 3 - ENGINEER

3.01 The Project has been designed by: Alliance Consulting Engineers, Inc., who is to act as Owner's representative, assume all duties and responsibilities, and have the rights and authority assigned to Engineer in the Contract Documents in connection with the completion of the Work in accordance with the Contract Documents.

ARTICLE 4 - CONTRACT TIMES

4.01 Time of the Essence

A. All time limits for Milestones for final payment as stated in the Contract Documents are of the essence of the Contract.

4.02 Dates for Substantial Completion and Final Payment

A. **The City of Newberry Recreational Complex on Approximately 200-Acres along SC Highway 34 for the City of Newberry in Newberry County, South Carolina will be completed within two hundred seventy (270) calendar days after the Notice to Proceed has been issued. Issuance of the Notice to Proceed shall be issued after the Notice of Intent to Award has been issued and the ten (10) day protest period commences after the County Council has accepted the recommendation from the Engineer.**

4.03 Liquidated Damages

A. Contractor and Owner recognize that time is of the essence of this Agreement and that Owner will suffer financial loss if the Work is not completed within the times specified in Paragraph 4.02 above, plus any extensions thereof allowed in accordance with Article 12 of the General Conditions. The parties also recognize the delays, expense, and difficulties

involved in proving in a legal or arbitration proceeding the actual loss suffered by Owner if the Work is not completed on time. Accordingly, instead of requiring any such proof, Owner and Contractor agree that as liquidated damages for delay (but not as a penalty), Contractor shall pay Owner $500 for each calendar day the site that expires after the time specified in Paragraph 4.02 for completion and readiness for final payment until the Work is completed and ready for final payment.

ARTICLE 5 - CONTRACT PRICE

5.01 Owner shall pay Contractor for completion of the Work in accordance with the Contract Documents an amount in current funds equal to the sum of the amounts determined pursuant to Paragraphs 5.01.A below:

A. For all Unit Price Work, an amount equal to the sum of the established unit price for each separately identified item of Unit Price Work times the estimated quantity of that item as indicated in the Bid Form attached hereto as part of these Contract Documents.

ARTICLE 6 - PAYMENT PROCEDURES

6.01 Submittal and Processing of Payments

A. Contractor shall submit Applications for Payment in accordance with Article 14 of the General Conditions. Applications for Payment will be processed by Engineer as provided in the General Conditions.

6.02 Progress Payments; Retainage

A. Owner shall make progress payments on account of the Contract Price on the basis of Contractor's Applications for Payment on or about the 15th day of each month during performance of the Work as provided in Paragraphs 6.02.A.1 and 6.02.A.2 below. All such payments will be measured by the schedule of values established as provided in Paragraph 2.07.A of the General Conditions (and in the case of Unit Price Work based on the number of units completed) or, in the event there is no schedule of values, as provided in the General Requirements:

1. Prior to Substantial Completion, progress payments will be made in an amount equal to the percentage indicated below but, in each case, less the aggregate of payments previously made and less such amounts as Engineer may determine or Owner may withhold, including but not limited to liquidated damages, in accordance with Paragraph 14.02 of the General Conditions:

   a. **90%** of Work completed (with the balance being Retainage). If the Work has been 50% completed as determined by Engineer, and if the character and progress of the Work have been satisfactory to Owner and Engineer, Owner, on recommendation of Engineer, may determine that as long as the character and progress of the Work remain satisfactory to them, there will be no additional Retainage.

   b. **90%** of cost of materials and equipment not incorporated in the Work (with the balance being Retainage).

2. Upon Substantial Completion, Owner shall pay an amount sufficient to increase total payments to Contractor to **95%** of the Work completed, less such amounts as Engineer shall determine in accordance with Paragraph 14.02.B.5 of the General Conditions and less **5%** of Engineer's estimate of the value of Work to be completed or corrected as shown on the tentative list of items to be completed or corrected attached to the certificate of Substantial Completion.

6.03 Final Payment

A. Upon final completion and acceptance of the Work in accordance with Paragraph 14.07 of the General Conditions, Owner shall pay the remainder of the Contract Price as recommended by Engineer as provided in said Paragraph 14.07.

ARTICLE 7 - INTEREST

7.01 All moneys not paid when due as provided in Article 14 of the General Conditions shall bear interest at the rate of 1-1/2% per annum.

ARTICLE 8 – CONTRACTOR'S REPRESENTATIONS

8.01 In order to induce Owner to enter into this Agreement Contractor makes the following representations:

A. Contractor has examined and carefully studied the Contract Documents and the other related data identified in the Bidding Documents.

B. Contractor has visited the Site and become familiar with and is satisfied as to the general, local, and Site conditions that may affect cost, progress, and performance of the Work.

C. Contractor is familiar with and is satisfied as to all federal, state, and local Laws and Regulations that may affect cost, progress, and performance of the Work.

D. Contractor has carefully studied all: (1) reports of explorations and tests of subsurface conditions at or contiguous to the Site and all drawings of physical conditions in or relating to existing surface or subsurface structures at or contiguous to the Site (except Underground Facilities) which have been identified in Paragraph 4.02 of the General Conditions and (2) reports and drawings of a Hazardous Environmental Condition, if any, at the Site which has been identified in Paragraph 4.06 of the General Conditions.

E. Contractor has obtained and carefully studied (or assumes responsibility for doing so) all examinations, investigations, explorations, tests, studies, and data concerning conditions (surface, subsurface, and Underground Facilities) at or contiguous to the Site which may affect cost, progress, or performance of the Work or which relate to any aspect of the means, methods, techniques, sequences, and procedures of construction to be employed by Contractor, including any specific means, methods, techniques, sequences, and procedures of construction expressly required by the Bidding Documents, and safety precautions and programs incident thereto.

F. Contractor does not consider that any further examinations, investigations, explorations, tests, studies, or data are necessary for the performance of the Work at the Contract Price, within the Contract Times, and in accordance with the other terms and conditions of the Contract Documents.

G. Contractor is aware of the general nature of work to be performed by Owner and others at the Site that relates to the Work as indicated in the Contract Documents.

H. Contractor has correlated the information known to Contractor, information and observations obtained from visits to the Site, reports and drawings identified in the Contract Documents, and all additional examinations, investigations, explorations, tests, studies, and data with the Contract Documents.

I. Contractor has given Engineer written notice of all conflicts, errors, ambiguities, or discrepancies that Contractor has discovered in the Contract Documents, and the written resolution thereof by Engineer is acceptable to Contractor.

J. The Contract Documents are generally sufficient to indicate and convey understanding of all terms and conditions for performance and furnishing of the Work.

ARTICLE 9 - CONTRACT DOCUMENTS

9.01 Contents

A. The Contract Documents consist of the following:
   1. This Agreement (Section 00 52 00).
   2. Performance Bond (Section 00 61 13.13).
   3. Payment Bond (Section 00 61 13.16).
   4. General Conditions (Section 00 70 00).
   5. Contractor/Subcontract Qualifications (Section 00 45 13)
   6. Drawings Index (Section 00 01 15)
   7. Exhibits to this Agreement (enumerated as follows):
      a. Contractor's Bid (Section 00 41 00)

   8. The following which may be delivered or issued on or after the Effective Date of the Agreement and are not attached hereto:
      a. Notice to Proceed (Section 00 55 00).
      b. Work Change Directives as issued (Section 00 63 49)
      c. Change Order(s) as issued (Section 00 63 63)

B. The documents listed in Paragraph 9.01.A are attached to this Agreement (except as expressly noted otherwise above).

C. There are no Contract Documents other than those listed above in this Article 9.

D. The Contract Documents may only be amended, modified, or supplemented as provided in Paragraph 3.04 of the General Conditions.

ARTICLE 10 - MISCELLANEOUS

10.01 Terms

A. Terms used in this Agreement will have the meanings stated in the General Conditions.

10.02 Assignment of Contract

A. No assignment by a party hereto of any rights under or interests in the Contract will be binding on another party hereto without the written consent of the party sought to be bound; and, specifically but without limitation, moneys that may become due and moneys that are due may not be assigned without such consent (except to the extent that the effect of this restriction may be limited by law), and unless specifically stated to the contrary in any written consent to an assignment, no assignment will release or discharge the assignor from any duty or responsibility under the Contract Documents.

10.03 Successors and Assigns

A. Owner and Contractor each binds itself, its partners, successors, assigns, and legal representatives to the other party hereto, its partners, successors, assigns, and legal representatives in respect to all covenants, agreements, and obligations contained in the Contract Documents.

10.04 Severability

A. Any provision or part of the Contract Documents held to be void or unenforceable under any Law or Regulation shall be deemed stricken, and all remaining provisions shall continue to be valid and binding upon Owner and Contractor, who agree that the Contract Documents shall

be reformed to replace such stricken provision or part thereof with a valid and enforceable provision that comes as close as possible to expressing the intention of the stricken provision.

IN WITNESS WHEREOF, Owner and Contractor have signed this Agreement. One counterpart each has been delivered to Owner, Contractor, Engineer and provided to the Contractor for his Bonding Agency. All portions of the Contract Documents have been signed or identified by Owner and Contractor or on their behalf.

This Agreement will be effective on this _____ day of _____, 2018 (which is the Effective Date of the Agreement).

OWNER:	CONTRACTOR:
Newberry County	
By: **Wayne Adams**	By:
Title: **Administrator**	Title:
[CORPORATE SEAL]	[CORPORATE SEAL]
Attest:	Attest:
Title:	Title:
Address for giving notices:	Address for giving notices:
Newberry County	
P.O. Box 156 (Mailing)	
1309 College Street **Newberry, South Carolina 29108**	
	License No.: (Where applicable)
	Agent for service or process:

SECTION 00 55 00

NOTICE TO PROCEED

Dated: _____, 2018

Project: **The City of Newberry Recreational Complex on Approximately 200-Acres along SC Highway 34 for the City of Newberry in Newberry County, South Carolina**	Owner: **Newberry County**	Owner's Contract No.: **2018-05**
Contract: **The City of Newberry Recreational Complex on Approximately 200-Acres along SC Highway 34 for the City of Newberry in Newberry County, South Carolina**		Engineer's Project No.: **17125-0036**

Contractor:

Contractor's Address: [send Certified Mail, Return Receipt Requested]

You are notified that the Contract Times under the above contract will commence to run on _____. On or before that date, you are to start performing your obligations under the Contract Documents. In accordance with Article 4 of the Agreement, the date of Substantial Completion is _____, and the date of readiness for final payment is _____.

Before you may start any Work at the Site, Paragraph 2.01.B of the General Conditions provides that you and Owner must each deliver to the other (with copies to Engineer and other identified additional insureds) certificates of insurance which each is required to purchase and maintain in accordance with the Contract Documents.

	Newberry County
Contractor	Owner
by:	Given by:
	Wayne Adams
	County Administrator
Title	Title
Date	Date

Copy to Engineer

SECTION 00 61 13.13

PERFORMANCE BOND

Any singular reference to Contractor, Surety, Owner, or other party shall be considered plural where applicable.

CONTRACTOR (Name and Address):

SURETY (Name and Address of Principal Place of Business):

OWNER (Name and Address): **Newberry County**
P.O. Box 156 (Mailing)
1309 College Street
Newberry, SC 29108

CONTRACT
Date:
Amount:
Description (Name and Location): **The City of Newberry Recreational Complex on Approximately 200-Acres along SC Highway 34 for the City of Newberry in Newberry County, South Carolina**

BOND
Bond Number:
Date (Not earlier than Contract Date):
Amount:
Modifications to this Bond Form:

Surety and Contractor, intending to be legally bound hereby, subject to the terms printed on the reverse side hereof, do each cause this Performance Bond to be duly executed on its behalf by its authorized officer, agent, or representative.

CONTRACTOR AS PRINCIPAL
Company:

Signature: _____ (Seal)
Name and Title:

SURETY

_____ (Seal)
Surety's Name and Corporate Seal

By: _____
Signature and Title
(Attach Power of Attorney)

(Space is provided below for signatures of additional parties, if required.)

Attest: _____
Signature and Title

CONTRACTOR AS PRINCIPAL
Company:

Signature: _____ (Seal)
Name and Title:

SURETY

_____ (Seal)
Surety's Name and Corporate Seal

By: _____
Signature and Title
(Attach Power of Attorney)

Attest: _____
Signature and Title:

1. Contractor and Surety, jointly and severally, bind themselves, their heirs, executors, administrators, successors, and assigns to Owner for the performance of the Contract, which is incorporated herein by reference.

2. If Contractor performs the Contract, Surety and Contractor have no obligation under this Bond, except to participate in conferences as provided in Paragraph 3.1.

3. If there is no Owner Default, Surety's obligation under this Bond shall arise after:

   3.1. Owner has notified Contractor and Surety, at the addresses described in Paragraph 10 below, that Owner is considering declaring a Contractor Default and has requested and attempted to arrange a conference with Contractor and Surety to be held not later than 15 days after receipt of such notice to discuss methods of performing the Contract. If Owner, Contractor and Surety agree, Contractor shall be allowed a reasonable time to perform the Contract, but such an agreement shall not waive Owner's right, if any, subsequently to declare a Contractor Default; and

   3.2. Owner has declared a Contractor Default and formally terminated Contractor's right to complete the Contract. Such Contractor Default shall not be declared earlier than 20 days after Contractor and Surety have received notice as provided in Paragraph 3.1; and

   3.3. Owner has agreed to pay the Balance of the Contract Price to:

      1. Surety in accordance with the terms of the Contract;

      2. Another contractor selected pursuant to Paragraph 4.3 to perform the Contract.

4. When Owner has satisfied the conditions of Paragraph 3, Surety shall promptly and at Surety's expense take one of the following actions:

   4.1. Arrange for Contractor, with consent of Owner, to perform and complete the Contract; or

   4.2. Undertake to perform and complete the Contract itself, through its agents or through independent contractors; or

   4.3. Obtain bids or negotiated proposals from qualified contractors acceptable to Owner for a contract for performance and completion of the Contract, arrange for a contract to be prepared for execution by Owner and Contractor selected with Owner's concurrence, to be secured with performance and payment bonds executed by a qualified surety equivalent to the bonds issued on the Contract, and pay to Owner the amount of damages as described in Paragraph 6 in excess of the Balance of the Contract Price incurred by Owner resulting from Contractor Default; or

   4.4. Waive its right to perform and complete, arrange for completion, or obtain a new contractor and with reasonable promptness under the circumstances:

      1. After investigation, determine the amount for which it may be liable to Owner and, as soon as practicable after the amount is determined, tender payment therefor to Owner; or

      2. Deny liability in whole or in part and notify Owner citing reasons therefor.

5. If Surety does not proceed as provided in Paragraph 4 with reasonable promptness, Surety shall be deemed to be in default on this Bond 15 days after receipt of an additional written notice from Owner to Surety demanding that Surety perform its obligations under this Bond, and Owner shall be entitled to enforce any remedy available to Owner. If Surety proceeds as provided in Paragraph 4.4, and Owner refuses the payment tendered or Surety has denied liability, in whole or in part, without further notice Owner shall be entitled to enforce any remedy available to Owner.

6. After Owner has terminated Contractor's right to complete the Contract, and if Surety elects to act under Paragraph 4.1, 4.2, or 4.3 above, then the responsibilities of Surety to Owner shall not be greater than those of Contractor under the Contract, and the responsibilities of Owner to Surety shall not be greater than those of Owner under the Contract. To a limit of the amount of this Bond, but subject to commitment by Owner of the Balance of the Contract Price to mitigation of costs and damages on the Contract, Surety is obligated without duplication for:

   6.1. The responsibilities of Contractor for correction of defective Work and completion of the Contract;

   6.2. Additional legal, design professional, and delay costs resulting from Contractor's Default, and resulting from the actions or failure to act of Surety under Paragraph 4; and

   6.3. Liquidated damages, or if no liquidated damages are specified in the Contract, actual damages caused by delayed performance or non-performance of Contractor.

7. Surety shall not be liable to Owner or others for obligations of Contractor that are unrelated to the Contract, and the Balance of the Contract Price shall not be reduced or set off on account of any such unrelated obligations. No right of action shall accrue on this Bond to any person or entity other than Owner or its heirs, executors, administrators, or successors.

8. Surety hereby waives notice of any change, including changes of time, to Contract or to related subcontracts, purchase orders, and other obligations.

9. Any proceeding, legal or equitable, under this Bond may be instituted in any court of competent jurisdiction in the location in which the Work or part of the Work is located and shall be instituted within two years after Contractor Default or within two years after Contractor ceased working or within two years after Surety refuses or fails to perform its obligations under this Bond, whichever occurs first. If the provisions of this paragraph are void or prohibited by law, the minimum period of limitation available to sureties as a defense in the jurisdiction of the suit shall be applicable.

10. Notice to Surety, Owner, or Contractor shall be mailed or delivered to the address shown on the signature page.

11. When this Bond has been furnished to comply with a statutory requirement in the location where the Contract was to be performed, any provision in this Bond conflicting with said statutory requirement shall be deemed deleted herefrom and provisions conforming to such statutory requirement shall be deemed incorporated herein. The intent is that this Bond shall be construed as a statutory bond and not as a common law bond.

12. Definitions.

   12.1 Balance of the Contract Price: The total amount payable by Owner to Contractor under the Contract after all proper adjustments have been made, including allowance to Contractor of any amounts received or to be received by Owner in settlement of insurance or other Claims for damages to which Contractor is entitled, reduced by all valid and proper payments made to or on behalf of Contractor under the Contract.

   12.2. Contract: The agreement between Owner and Contractor identified on the signature page, including all Contract Documents and changes thereto.

   12.3. Contractor Default: Failure of Contractor, which has neither been remedied nor waived, to perform or otherwise to comply with the terms of the Contract.

   12.4. Owner Default: Failure of Owner, which has neither been remedied nor waived, to pay Contractor as required by the Contract or to perform and complete or comply with the other terms thereof.

FOR INFORMATION ONLY – Name, Address and Telephone
Surety Agency or Broker:
Owner's Representative (engineer or other party): **Alliance Consulting Engineers, Inc.**
P.O. Box 8147
Columbia, SC 29202-8147
(803) 779-2078

SECTION 00 61 13.13

PERFORMANCE BOND

Any singular reference to Contractor, Surety, Owner, or other party shall be considered plural where applicable.

CONTRACTOR (Name and Address):

SURETY (Name and Address of Principal Place of Business):

OWNER (Name and Address): **Newberry County**
P.O. Box 156 (Mailing)
1309 College Street
Newberry, SC 29108

CONTRACT
Date:
Amount:
Description (Name and Location): **The City of Newberry Recreational Complex on Approximately 200-Acres along SC Highway 34 for the City of Newberry in Newberry County, South Carolina**

BOND
Bond Number:
Date (Not earlier than Contract Date):
Amount:
Modifications to this Bond Form:

Surety and Contractor, intending to be legally bound hereby, subject to the terms printed on the reverse side hereof, do each cause this Performance Bond to be duly executed on its behalf by its authorized officer, agent, or representative.

CONTRACTOR AS PRINCIPAL
Company:

Signature: _____ (Seal)
Name and Title:

SURETY

_____ (Seal)
Surety's Name and Corporate Seal

By: _____
Signature and Title
(Attach Power of Attorney)

(Space is provided below for signatures of additional parties, if required.)

Attest: _____
Signature and Title

CONTRACTOR AS PRINCIPAL
Company:

Signature: _____ (Seal)
Name and Title:

SURETY

_____ (Seal)
Surety's Name and Corporate Seal

By: _____
Signature and Title
(Attach Power of Attorney)

Attest: _____
Signature and Title:

1. Contractor and Surety, jointly and severally, bind themselves, their heirs, executors, administrators, successors, and assigns to Owner for the performance of the Contract, which is incorporated herein by reference.

2. If Contractor performs the Contract, Surety and Contractor have no obligation under this Bond, except to participate in conferences as provided in Paragraph 3.1.

3. If there is no Owner Default, Surety's obligation under this Bond shall arise after:

   3.1. Owner has notified Contractor and Surety, at the addresses described in Paragraph 10 below, that Owner is considering declaring a Contractor Default and has requested and attempted to arrange a conference with Contractor and Surety to be held not later than 15 days after receipt of such notice to discuss methods of performing the Contract. If Owner, Contractor and Surety agree, Contractor shall be allowed a reasonable time to perform the Contract, but such an agreement shall not waive Owner's right, if any, subsequently to declare a Contractor Default; and

   3.2. Owner has declared a Contractor Default and formally terminated Contractor's right to complete the Contract. Such Contractor Default shall not be declared earlier than 20 days after Contractor and Surety have received notice as provided in Paragraph 3.1; and

   3.3. Owner has agreed to pay the Balance of the Contract Price to:

      1. Surety in accordance with the terms of the Contract;

      2. Another contractor selected pursuant to Paragraph 4.3 to perform the Contract.

4. When Owner has satisfied the conditions of Paragraph 3, Surety shall promptly and at Surety's expense take one of the following actions:

   4.1. Arrange for Contractor, with consent of Owner, to perform and complete the Contract; or

   4.2. Undertake to perform and complete the Contract itself, through its agents or through independent contractors; or

   4.3. Obtain bids or negotiated proposals from qualified contractors acceptable to Owner for a contract for performance and completion of the Contract, arrange for a contract to be prepared for execution by Owner and Contractor selected with Owner's concurrence, to be secured with performance and payment bonds executed by a qualified surety equivalent to the bonds issued on the Contract, and pay to Owner the amount of damages as described in Paragraph 6 in excess of the Balance of the Contract Price incurred by Owner resulting from Contractor Default; or

   4.4. Waive its right to perform and complete, arrange for completion, or obtain a new contractor and with reasonable promptness under the circumstances:

      1. After investigation, determine the amount for which it may be liable to Owner and, as soon as practicable after the amount is determined, tender payment therefor to Owner; or

      2. Deny liability in whole or in part and notify Owner citing reasons therefor.

5. If Surety does not proceed as provided in Paragraph 4 with reasonable promptness, Surety shall be deemed to be in default on this Bond 15 days after receipt of an additional written notice from Owner to Surety demanding that Surety perform its obligations under this Bond, and Owner shall be entitled to enforce any remedy available to Owner. If Surety proceeds as provided in Paragraph 4.4, and Owner refuses the payment tendered or Surety has denied liability, in whole or in part, without further notice Owner shall be entitled to enforce any remedy available to Owner.

6. After Owner has terminated Contractor's right to complete the Contract, and if Surety elects to act under Paragraph 4.1, 4.2, or 4.3 above, then the responsibilities of Surety to Owner shall not be greater than those of Contractor under the Contract, and the responsibilities of Owner to Surety shall not be greater than those of Owner under the Contract. To a limit of the amount of this Bond, but subject to commitment by Owner of the Balance of the Contract Price to mitigation of costs and damages on the Contract, Surety is obligated without duplication for:

   6.1. The responsibilities of Contractor for correction of defective Work and completion of the Contract;

   6.2. Additional legal, design professional, and delay costs resulting from Contractor's Default, and resulting from the actions or failure to act of Surety under Paragraph 4; and

   6.3. Liquidated damages, or if no liquidated damages are specified in the Contract, actual damages caused by delayed performance or non-performance of Contractor.

7. Surety shall not be liable to Owner or others for obligations of Contractor that are unrelated to the Contract, and the Balance of the Contract Price shall not be reduced or set off on account of any such unrelated obligations. No right of action shall accrue on this Bond to any person or entity other than Owner or its heirs, executors, administrators, or successors.

8. Surety hereby waives notice of any change, including changes of time, to Contract or to related subcontracts, purchase orders, and other obligations.

9. Any proceeding, legal or equitable, under this Bond may be instituted in any court of competent jurisdiction in the location in which the Work or part of the Work is located and shall be instituted within two years after Contractor Default or within two years after Contractor ceased working or within two years after Surety refuses or fails to perform its obligations under this Bond, whichever occurs first. If the provisions of this paragraph are void or prohibited by law, the minimum period of limitation available to sureties as a defense in the jurisdiction of the suit shall be applicable.

10. Notice to Surety, Owner, or Contractor shall be mailed or delivered to the address shown on the signature page.

11. When this Bond has been furnished to comply with a statutory requirement in the location where the Contract was to be performed, any provision in this Bond conflicting with said statutory requirement shall be deemed deleted herefrom and provisions conforming to such statutory requirement shall be deemed incorporated herein. The intent is that this Bond shall be construed as a statutory bond and not as a common law bond.

12. Definitions.

   12.1 Balance of the Contract Price: The total amount payable by Owner to Contractor under the Contract after all proper adjustments have been made, including allowance to Contractor of any amounts received or to be received by Owner in settlement of insurance or other Claims for damages to which Contractor is entitled, reduced by all valid and proper payments made to or on behalf of Contractor under the Contract.

   12.2. Contract: The agreement between Owner and Contractor identified on the signature page, including all Contract Documents and changes thereto.

   12.3. Contractor Default: Failure of Contractor, which has neither been remedied nor waived, to perform or otherwise to comply with the terms of the Contract.

   12.4. Owner Default: Failure of Owner, which has neither been remedied nor waived, to pay Contractor as required by the Contract or to perform and complete or comply with the other terms thereof.

FOR INFORMATION ONLY – Name, Address and Telephone
Surety Agency or Broker:
Owner's Representative (engineer or other party): **Alliance Consulting Engineers, Inc.**
P.O. Box 8147
Columbia, SC 29202-8147
(803) 779-2078

SECTION 00 63 36

FIELD ORDER

No. _____

Date of Issuance: _____ Effective Date: _____

Project: **The City of Newberry Recreational Complex on Approximately 200-Acres along SC Highway 34 for the City of Newberry in Newberry County, South Carolina**	Owner: **Newberry County**	Owner's Contract No.: **2018-05**
Contract: **The City of Newberry Recreational Complex on Approximately 200-Acres along SC Highway 34 for the City of Newberry in Newberry County, South Carolina**		Date of Contract:
Contractor:		Engineer's Project No.: **17125-0036**

Attention:
You are hereby directed to promptly execute this Field Order issued in accordance with General Conditions Paragraph 9.05A., for minor changes in the Work without changes in Contract Price or Contract Times. If you consider that a change in Contract Price or Contract Times is required, please notify the Engineer immediately and before proceeding with this Work.

Reference: _____ _____
(Specification Section(s)) (Drawing(s) / Detail(s))

Description:

Attachments:

Engineer: Benjamin S. Whaley, P.E.

Receipt Acknowledged by (Contractor):	Date:

Copy to Owner

SECTION 00 63 49

WORK CHANGE DIRECTIVE

No. _____

Date of Issuance: _____ Effective Date: _____

Project: **The City of Newberry Recreational Complex on Approximately 200-Acres along SC Highway 34 for the City of Newberry in Newberry County, South Carolina**	Owner: **Newberry County**	Owner's Contract No.: **2018-05**
Contract: **The City of Newberry Recreational Complex on Approximately 200-Acres along SC Highway 34 for the City of Newberry in Newberry County, South Carolina**		Date of Contract:
Contractor:		Engineer's Project No.: **17125-0036**

You are directed to proceed promptly with the following change(s):

Item No.	Description

Attachments (list documents supporting change):

Purpose for Work Change Directive:

☐ Authorization for Work described herein to proceed on the basis of Cost of the Work due to:

☐ Nonagreement on pricing of proposed change.

☐ Necessity to expedite Work described herein prior to agreeing to changes on Contract Price and Contract Time.

Estimated change in Contract Price and Contract Times:

Contract Price $ _____ (increase/decrease) Contract Time _____ (increase/decrease)
days

If the change involves an increase, the estimated amounts are not to be exceeded without further authorization.

Recommended for Approval by Engineer: (Benjamin S. Whaley, P.E.)	Date
Authorized for Owner by: (Wayne Adams)	Date
Accepted for Contractor by:	Date
Approved by Funding Agency (if applicable):	Date:

SECTION 00 63 63

CHANGE ORDER

No. _____

Date of Issuance: _____ Effective Date: _____

Project: **The City of Newberry Recreational Complex on Approximately 200-Acres along SC Highway 34 for the City of Newberry in Newberry County, South Carolina**	Owner: **Newberry County**	Owner's Contract No.: **2018-05**
Contract: **The City of Newberry Recreational Complex on Approximately 200-Acres along SC Highway 34 for the City of Newberry in Newberry County, South Carolina**		Date of Contract:
Contractor:		Engineer's Project No.: **17125-0036**

The Contract Documents are modified as follows upon execution of this Change Order:

Description:

Attachments: (List documents supporting change):

CHANGE IN CONTRACT PRICE:	**CHANGE IN CONTRACT TIMES:**
Original Contract Price:	Original Contract Times: ☐ Working days ☐ Calendar days
	Substantial completion (days or date): _____
$_____	Ready for final payment (days or date): _____
[Increase] [Decrease] from previously approved Change Orders No._____ to No._____:	[Increase] [Decrease] from previously approved Change Orders No._____ to No._____:
	Substantial completion (days): _____
$_____	Ready for final payment (days): _____
Contract Price prior to this Change Order:	Contract Times prior to this Change Order:
	Substantial completion (days or date): _____
$_____	Ready for final payment (days or date): _____
[Increase] [Decrease] of this Change Order:	[Increase] [Decrease] of this Change Order:
	Substantial completion (days or date): _____
$_____	Ready for final payment (days or date): _____
Contract Price incorporating this Change Order:	Contract Times with all approved Change Orders:
	Substantial completion (days or date): _____
$_____	Ready for final payment (days or date): _____

REQUESTED:	RECOMMENDED:	APPROVED:
By: _____	By: _____	By: _____
Contractor: (Authorized Signature)	Engineer: Benjamin S. Whaley, P.E.	Owner: Wayne Adams, County Administrator
Date: _____	Date: _____	Date: _____

Approved by Funding Agency (if applicable): _____ Date: _____

SECTION 00 65 16

CERTIFICATE OF SUBSTANTIAL COMPLETION

Project: **The City of Newberry Recreational Complex on Approximately 200-Acres along SC Highway 34 for the City of Newberry in Newberry County, South Carolina**	Owner: **Newberry County**	Owner's Contract No.: **2018-05**
Contract:		Date of Contract:
Contractor:		Engineer's Project No.: **17125-0036**

This [tentative] [definitive] Certificate of Substantial Completion applies to:

☐ All Work under the Contract Documents: ☐ The following specified portions:

The Work to which this Certificate applies has been inspected by authorized representatives of Owner, Contractor and Engineer, and found to be substantially complete. The Date of Substantial Completion of the Project or portion thereof designated above is hereby declared and is also the date of commencement of applicable warranties required by the Contract Documents, except as stated below.

A [tentative] [revised tentative] [definitive] list of items to be completed or corrected, is attached hereto. This list may not be all-inclusive, and the failure to include any items on such list does not alter the responsibility of the Contractor to complete all Work in accordance with the Contract Documents.

The responsibilities between OWNER and CONTRACTOR for security, operation, safety, maintenance, heat, utilities, insurance and warranties shall be as provided in the Contract Documents except as amended as follows:

☐ Amended Responsibilities ☐ Not Amended

Owner's Amended Responsibilities:

Contractor's Amended Responsibilities:

The following documents are attached to and made part of this Certificate:

This Certificate does not constitute an acceptance of Work not in accordance with the Contract Documents nor is it a release of Contractor's obligation to complete the Work in accordance with the Contract Documents.

Executed by Engineer: Benjamin S. Whaley, P.E. Date

Accepted by Contractor: Date

Accepted by Owner: Mr. Wayne Adams, County Administrator Date

SECTION 00 65 19.13

CONTRACTOR'S AFFIDAVIT

The State of _____ Date: _____

The County of _____

The City/Town of _____

_____ _____ of _____
(Officer's Name) (Officer's Title) (Contractor's Name)

being duly sworn, deposes and says that _____
(Contractor's Name)

has furnished all labor and material entering into the **The City of Newberry Recreational Complex on Approximately 200-Acres along SC Highway 34 for the City of Newberry in Newberry County, South Carolina**
(Name and Location of Work)

called for in the Contract Documents dated _____ with **Newberry County** states further that this officer has full knowledge of all obligations for such labor and materials, which have entered into and become part of that certain project known and designated above, and that this officer further deposes and says that all debts and other obligations for such labor and materials have been fully and completely paid for in good and lawful money of the United States of America and that there are no suits for damages against them proceeding, prospective and/or otherwise, in consequence of their operations on the above said project.

The said _____ will hold the Owners,
(Contractor's Name)
Newberry County , blameless of any and all mechanic's liens that may be hereafter entered or filed
(Owner's Name)
for record, so as to constitute charge against said premises for work or labor done or materials furnished by them.

IN WITNESS HEREOF, this officer has heretofore put his hand and seal:

_____(Seal)
(Officer's Name)

I, _____, Notary Public in and for the above named County and State do

hereby certify that _____ personally known to me to be the affiant in the
(Officer's Name)
foregoing Affidavit, personally appeared before me this day and, having been duly sworn, deposes and says that the facts set forth in the above Affidavit are true and correct.

WITNESS my hand and seal this ____ day of _____, 20_18____

_____ (Seal)

Notary Public for the State of _____My Commission Expires: _____

SECTION 00 70 00

STANDARD GENERAL CONDITIONS OF THE CONSTRUCTION CONTRACT

PART 1 - DEFINITIONS AND TERMINOLOGY

1.01 Defined Terms

A. Wherever used in the Bidding Requirements or Contract Documents and printed with initial capital letters, the terms listed below will have the meanings indicated which are applicable to both the singular and plural thereof. In addition to terms specifically defined, terms with initial capital letters in the Contract Documents include references to identified Parts and paragraphs, and the titles of other documents or forms.

1. Addenda – Written or graphic instruments issued prior to the opening of Bids which clarify, correct, or change the Bidding Requirements or the proposed Contract Documents.

2. Agreement – The written instrument which is evidence of the agreement between Owner and Contractor covering the Work.

3. Application for Payment – The form acceptable to Engineer which is to be used by Contractor during the course of the Work in requesting progress or final payments and which is to be accompanied by such supporting documentation as is required by the Contract Documents.

4. Asbestos – Any material that contains more than one percent asbestos and is friable or is releasing asbestos fibers into the air above current action levels established by the United States Occupational Safety and Health Administration.

5. Bid – The offer or proposal of a Bidder submitted on the prescribed form setting forth the prices for the Work to be performed.

6. Bidder – The individual or entity who submits a Bid directly to Owner.

7. Bidding Documents – The Bidding Requirements and the proposed Contract Documents (including all Addenda).

8. Bidding Requirements – The Advertisement or Invitation to Bid, Instructions to Bidders, bid security of acceptable form, if any, and the Bid Form with any supplements.

9. Change Order – A document recommended by Engineer which is signed by Contractor and Owner and authorizes an addition, deletion, or revision in the Work or an adjustment in the Contract Price or the Contract Times, issued on or after the Effective Date of the Agreement.

10. Claim – A demand or assertion by Owner or Contractor seeking an adjustment of Contract Price or Contract Times, or both, or other relief with respect to the terms of the Contract. A demand for money or services by a third party is not a Claim.

11. Contract – The entire and integrated written agreement between the Owner and Contractor concerning the Work. The Contract supersedes prior negotiations, representations, or agreements, whether written or oral.

12. Contract Documents – Those items so designated in the Agreement. Only printed or hard copies of the items listed in the Agreement are Contract Documents. Approved Shop Drawings, other Contractor's submittals, and the reports and drawings of subsurface and physical conditions are not Contract Documents.

13. Contract Price – The moneys payable by Owner to Contractor for completion of the Work in accordance with the Contract Documents as stated in the Agreement (subject to the provisions of Paragraph 11.03 in the case of Unit Price Work).

14. Contract Times – The number of days or the dates stated in the Agreement to: (i) achieve Milestones, if any, (ii) achieve Substantial Completion; and (iii) complete the Work so that it is ready for final payment as evidenced by Engineer's written recommendation of final payment.

15. Contractor – The individual or entity with whom Owner has entered into the Agreement.

16. Cost of the Work – See Paragraph 11.01.A for definition.

17. Drawings – That part of the Contract Documents prepared or approved by Engineer which graphically shows the scope, extent, and character of the Work to be performed by Contractor. Shop Drawings and other Contractor submittals are not Drawings as so defined.

18. 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.

19. Engineer – The individual or entity named as such in the Agreement.

20. Field Order – A written order issued by Engineer which requires minor changes in the Work but which does not involve a change in the Contract Price or the Contract Times.

21. General Requirements – Sections of Division 1 of the Specifications. The General Requirements pertain to all sections of the Specifications.

22. Hazardous Environmental Condition – The presence at the Site of Asbestos, PCBs, Petroleum, Hazardous Waste, or Radioactive Material in such quantities or circumstances that may present a substantial danger to persons or property exposed thereto in connection with the Work.

23. Hazardous Waste – The term Hazardous Waste shall have the meaning provided in Section 1004 of the Solid Waste Disposal Act (42 USC Section 6903) as amended from time to time.

24. Laws and Regulations; Laws or Regulations – Any and all applicable laws, rules, regulations, ordinances, codes, and orders of any and all governmental bodies, agencies, authorities, and courts having jurisdiction.

25. Liens – Charges, security interests, or encumbrances upon Project funds, real property, or personal property.

26. Milestone – A principal event specified in the Contract Documents relating to an intermediate completion date or time prior to Substantial Completion of all the Work.

27. Notice of Award – The written notice by Owner to the Successful Bidder stating that upon timely compliance by the Successful Bidder with the conditions precedent listed therein, Owner will sign and deliver the Agreement.

28. Notice to Proceed – A written notice given by Owner to Contractor fixing the date on which the Contract Times will commence to run and on which Contractor shall start to perform the Work under the Contract Documents.

29. Owner – The individual or entity with whom Contractor has entered into the Agreement and for whom the Work is to be performed.

30. PCBs – Polychlorinated biphenyls.

31. Petroleum – Petroleum, including crude oil or any fraction thereof which is liquid at standard conditions of temperature and pressure (60 degrees Fahrenheit and 14.7 pounds per square inch absolute), such as oil, petroleum, fuel oil, oil sludge, oil refuse, gasoline, kerosene, and oil mixed with other non-Hazardous Waste and crude oils.

32. Progress Schedule – A schedule, prepared and maintained by Contractor, describing the sequence and duration of the activities comprising the Contractor's plan to accomplish the Work within the Contract Times.

33. Project – The total construction of which the Work to be performed under the Contract Documents may be the whole, or a part.

34. Project Manual – The bound documentary information prepared for bidding and constructing the Work. A listing of the contents of the Project Manual, which may be bound in one or more volumes, is contained in the table(s) of contents.

35. Radioactive Material – Source, special nuclear, or byproduct material as defined by the Atomic Energy Act of 1954 (42 USC Section 2011 et seq.) as amended from time to time.

36. Related Entity – An officer, director, partner, employee, agent, consultant, or subcontractor.

37. Resident Project Representative – The authorized representative of Engineer who may be assigned to the Site or any part thereof.

38. Samples – Physical examples of materials, equipment, or workmanship that are representative of some portion of the Work and which establish the standards by which such portion of the Work will be judged.

39. Schedule of Submittals – A schedule, prepared and maintained by Contractor, of required submittals and the time requirements to support scheduled performance of related construction activities.

40. Schedule of Values – A schedule, prepared and maintained by Contractor, allocating portions of the Contract Price to various portions of the Work and used as the basis for reviewing Contractor's Applications for Payment.

41. Shop Drawings – All drawings, diagrams, illustrations, schedules, and other data or information which are specifically prepared or assembled by or for Contractor and submitted by Contractor to illustrate some portion of the Work.

42. Site – Lands or areas indicated in the Contract Documents as being furnished by Owner upon which the Work is to be performed, including rights-of-way and easements for access thereto, and such other lands furnished by Owner which are designated for the use of Contractor.

43. Specifications – That part of the Contract Documents consisting of written requirements for materials, equipment, systems, standards and workmanship as applied to the Work, and certain administrative requirements and procedural matters applicable thereto.

44. Subcontractor – An individual or entity having a direct contract with Contractor or with any other Subcontractor for the performance of a part of the Work at the Site.

45. Substantial Completion – The time at which the Work (or a specified part thereof) has progressed to the point where, in the opinion of Engineer, the Work (or a specified part thereof) is sufficiently complete, in accordance with the Contract Documents, so that the Work (or a specified part thereof) can be utilized for the purposes for which it is intended. The terms “substantially complete” and “substantially completed” as applied to all or part of the Work refer to Substantial Completion thereof.

46. Successful Bidder – The Bidder submitting a responsive Bid to whom Owner makes an award.

47. Supplementary Conditions – That part of the Contract Documents which amends or supplements these General Conditions.

48. Supplier – A manufacturer, fabricator, supplier, distributor, material man, or vendor having a direct contract with Contractor or with any Subcontractor to furnish materials or equipment to be incorporated in the Work by Contractor or any Subcontractor.

49. Underground Facilities – All underground pipelines, conduits, ducts, cables, wires, manholes, vaults, tanks, tunnels, or other such facilities or attachments, and any encasements containing such facilities, including those that convey electricity, gases, steam, liquid petroleum products, telephone or other communications, cable television, water, wastewater, storm water, other liquids or chemicals, or traffic or other control systems.

50. Unit Price Work – Work to be paid for on the basis of unit prices.

51. Work – The entire construction or the various separately identifiable parts thereof required to be provided under the Contract Documents. Work includes and is the result of performing or providing all labor, services, and documentation necessary to produce such construction, and furnishing, installing, and incorporating all materials and equipment into such construction, all as required by the Contract Documents.

52. Work Change Directive – A written statement to Contractor issued on or after the Effective Date of the Agreement and signed by Owner and recommended by Engineer ordering an addition, deletion, or revision in the Work, or responding to differing or unforeseen subsurface or physical conditions under which the Work is to be performed or to emergencies. A Work Change Directive will not change the Contract Price or the Contract Times but is evidence that the parties expect that the change ordered or documented by a Work Change Directive will be incorporated in a subsequently issued Change Order following negotiations by the parties as to its effect, if any, on the Contract Price or Contract Times.

1.02 Terminology

A. The following words or terms are not defined but, when used in the Bidding Requirements or Contract Documents, have the following meaning.

B. Intent of Certain Terms or Adjectives

1. The Contract Documents include the terms “as allowed,” “as approved,” “as ordered”, “as directed” or terms of like effect or import to authorize an exercise of professional judgment by Engineer. In addition, the adjectives “reasonable,” “suitable,” “acceptable,” “proper,” “satisfactory,” or adjectives of like effect or import are used to describe an action or determination of Engineer as to the Work. It is intended that such exercise of professional judgment, action or determination will be solely to evaluate, in general, the Work for compliance with the requirements of and information in the Contract Documents and conformance with the design concept of the completed Project as a functioning whole as shown or indicated in the Contract Documents (unless there is a specific statement indicating otherwise). The use of any such term or adjective is not intended to and shall not be effective to assign to Engineer any duty or authority to supervise or direct the performance of the Work or any duty or authority to undertake responsibility contrary to the provisions of Paragraph 9.09 or any other provision of the Contract Documents.

C. Day

1. The word “day” means a calendar day of 24 hours measured from midnight to the next midnight.

D. Defective

1. The word “defective,” when modifying the word “Work,” refers to Work that is unsatisfactory, faulty, or deficient in that it:

a. does not conform to the Contract Documents, or

b. does not meet the requirements of any applicable inspection, reference standard, test, or approval referred to in the Contract Documents, or

c. has been damaged prior to Engineer’s recommendation of final payment (unless responsibility for the protection thereof has been assumed by Owner at Substantial Completion in accordance with Paragraph 14.04 or 14.05).

E. Furnish, Install, Perform, Provide

1. The word “furnish,” when used in connection with services, materials, or equipment, shall mean to supply and deliver said services, materials, or equipment to the Site (or some other specified location) ready for use or installation and in usable or operable condition.

2. The word “install,” when used in connection with services, materials, or equipment, shall mean to put into use or place in final position said services, materials, or equipment complete and ready for intended use.

3. The words “perform” or “provide,” when used in connection with services, materials, or equipment, shall mean to furnish and install said services, materials, or equipment complete and ready for intended use.

4. When “furnish,” “install,” “perform,” or “provide” is not used in connection with services, materials, or equipment in a context clearly requiring an obligation of Contractor, “provide” is implied.

F. Unless stated otherwise in the Contract Documents, words or phrases which have a well-known technical or construction industry or trade meaning are used in the Contract Documents in accordance with such recognized meaning.

PART 2 - PRELIMINARY MATTERS

2.01 Delivery of Bonds and Evidence of Insurance

A. When Contractor delivers the executed counterparts of the Agreement to Owner, Contractor shall also deliver to Owner such bonds as Contractor may be required to furnish.

B. Evidence of Insurance: Before any Work at the Site is started, Contractor and Owner shall each deliver to the other, with copies to each additional insured identified in the General Conditions, certificates of insurance (and other evidence of insurance which either of them or any additional insured may reasonably request) which Contractor and Owner respectively are required to purchase and maintain in accordance with Part 5.

2.02 Copies of Documents

A. Owner shall furnish to Contractor up to six (6) printed or hard copies of the Drawings and Project Manual. Additional copies will be furnished upon request at the cost of reproduction.

2.03 Commencement of Contract Times; Notice to Proceed

A. The Notice to Proceed shall follow the Notice of Intent to Award, after Council has awarded ant the protest period has expired. The official date of commencement will be the date of Notice to Proceed.

2.04 Starting the Work

A. Contractor shall start to perform the Work on the date when the Contract Times commence to run. No Work shall be done at the Site prior to the date on which the Contract Times commence to run.

2.05 Before Starting Construction

A. *Preliminary Schedules:* Within ten (10) days after the Effective Date of the Agreement (unless otherwise specified in the General Requirements), Contractor shall submit to Engineer for timely review**:**

1. a preliminary Progress Schedule; indicating the times (numbers of days or dates) for starting and completing the various stages of the Work, including any Milestones specified in the Contract Documents;

2. a preliminary Schedule of Submittals; and

3. a preliminary Schedule of Values for all of the Work which includes quantities and prices of items which when added together equal the Contract Price and subdivides the Work into component parts in sufficient detail to serve as the basis for progress payments during performance of the Work. Such prices will include an appropriate amount of overhead and profit applicable to each item of Work.

2.06 Preconstruction Conference

A. Before any Work at the Site is started, a conference attended by Owner, Contractor, Engineer, and others as appropriate will be held to establish a working understanding among the parties as to the Work and to discuss the schedules referred to in Paragraph 2.05.A, procedures for handling Shop Drawings and other submittals, processing Applications for Payment, and maintaining required records.

2.07 Initial Acceptance of Schedules

A. At least ten (10) days before submission of the first Application for Payment a conference attended by Contractor, Engineer, and others as appropriate will be held to review for acceptability to Engineer as provided below the schedules submitted in accordance with Paragraph 2.05.A. Contractor shall have an additional ten (10) days to make corrections and adjustments and to complete and resubmit the schedules. No progress payment shall be made to Contractor until acceptable schedules are submitted to Engineer.

1. The Progress Schedule will be acceptable to Engineer if it provides an orderly progression of the Work to completion within the Contract Times. Such acceptance will not impose on Engineer responsibility for the Progress Schedule, for sequencing, scheduling, or progress of the Work nor interfere with or relieve Contractor from Contractor's full responsibility therefor.

2. Contractor's Schedule of Submittals will be acceptable to Engineer if it provides a workable arrangement for reviewing and processing the required submittals.

3. Contractor's Schedule of Values will be acceptable to Engineer as to form and substance if it provides a reasonable allocation of the Contract Price to component parts of the Work.

PART 3 – CONTRACT DOCUMENTS: INTENT, AMENDING, REUSE

3.01 Intent

A. The Contract Documents are complementary; what is required by one is as binding as if required by all.

B. It is the intent of the Contract Documents to describe a functionally complete Project (or part thereof) to be constructed in accordance with the Contract Documents. Any labor, documentation, services, materials, or equipment that may reasonably be inferred from the Contract Documents or from prevailing custom or trade usage as being required to produce the intended result will be provided whether or not specifically called for at no additional cost to Owner.

C. Clarifications and interpretations of the Contract Documents shall be issued by Engineer as provided in Part 9.

3.02 Reference Standards

A. Standards, Specifications, Codes, Laws, and Regulations

1. Reference to standards, specifications, manuals, or codes of any technical society, organization, or association, or to Laws or Regulations, whether such reference be specific or by implication, shall mean the standard, specification, manual, code, or Laws or Regulations in effect at the time of opening of Bids (or on the Effective Date of the Agreement if there were no Bids), except as may be otherwise specifically stated in the Contract Documents.

2. No provision of any such standard, specification, manual or code, or any instruction of a Supplier shall be effective to change the duties or responsibilities of Owner, Contractor, or Engineer, or any of their subcontractors, consultants, agents, or employees from those set forth in the Contract Documents. No such provision or instruction shall be effective to assign to Owner, or Engineer, or any of, their Related Entities, any duty or authority to supervise or direct the performance of the Work or any duty or authority to undertake responsibility inconsistent with the provisions of the Contract Documents.

3.03 Reporting and Resolving Discrepancies

A. Reporting Discrepancies

1. *Contractor's Review of Contract Documents Before Starting Work*: Before undertaking each part of the Work, Contractor shall carefully study and compare the Contract Documents and check and verify pertinent figures therein and all applicable field measurements. Contractor shall promptly report in writing to Engineer any conflict, error, ambiguity, or discrepancy which Contractor may discover and shall obtain a written interpretation or clarification from Engineer before proceeding with any Work affected thereby.

2. *Contractor's Review of Contract Documents During Performance of Work*: If, during the performance of the Work, Contractor discovers any conflict, error, ambiguity, or discrepancy within the Contract Documents or between the Contract Documents and any provision of any Law or Regulation applicable to the performance of the Work or of any standard, specification, manual or code, or of any instruction of any Supplier, Contractor shall promptly report it to Engineer in writing. Contractor shall not proceed with the Work affected thereby (except in an emergency as required by Paragraph 6.16.A) until an amendment or supplement to the Contract Documents has been issued by one of the methods indicated in Paragraph 3.04.

3. Contractor shall not be liable to Owner or Engineer for failure to report any conflict, error, ambiguity, or discrepancy in the Contract Documents unless Contractor knew or reasonably should have known thereof.

B. Resolving Discrepancies

1. Except as may be otherwise specifically stated in the Contract Documents, the provisions of the Contract Documents shall take precedence in resolving any conflict, error, ambiguity, or discrepancy between the provisions of the Contract Documents and:

a. the provisions of any standard, specification, manual, code, or instruction (whether or not specifically incorporated by reference in the Contract Documents); or

b. the provisions of any Laws or Regulations applicable to the performance of the Work (unless such an interpretation of the provisions of the Contract Documents would result in violation of such Law or Regulation).

3.04 Amending and Supplementing Contract Documents

A. The Contract Documents may be amended to provide for additions, deletions, and revisions in the Work or to modify the terms and conditions thereof by either a Change Order or a Work Change Directive.

B. The requirements of the Contract Documents may be supplemented and minor variations and deviations in the Work may be authorized, by one or more of the following ways:

1. A Field Order;

2. Engineer's approval of a Shop Drawing or Sample; (Subject to the provisions of Paragraph 6.17.D.3); or

3. Engineer's written interpretation or clarification.

3.05 Reuse of Documents

A. Contractor and any Subcontractor or Supplier or other individual or entity performing or furnishing all of the Work under a direct or indirect contract with Contractor, shall not:

1. have or acquire any title to or ownership rights in any of the Drawings, Specifications, or other documents (or copies of any thereof) prepared by or bearing the seal of Engineer or Engineer's consultants, including electronic media editions; or

2. reuse any of such Drawings, Specifications, other documents, or copies thereof on extensions of the Project or any other project without written consent of Owner and Engineer and specific written verification or adaption by Engineer.

B. The prohibition of this Paragraph 3.05 will survive final payment, or termination of the Contract. Nothing herein shall preclude Contractor from retaining copies of the Contract Documents for record purposes.

3.06 Electronic Data

A. Copies of data furnished by Owner or Engineer to Contractor or Contractor to Owner or Engineer that may be relied upon are limited to the printed copies (also known as hard copies). Files in electronic media format of text, data, graphics, or other types are furnished only for the convenience of the receiving party. Any conclusion or information obtained or derived from such electronic files will be at the user's sole risk. If there is a discrepancy between the electronic files and the hard copies, the hard copies govern.

B. Because data stored in electronic media format can deteriorate or be modified inadvertently or otherwise without authorization of the data's creator, the party receiving electronic files agrees that it will perform acceptance tests or procedures within 60 days, after which the receiving party shall be deemed to have accepted the data thus transferred. Any errors detected within the 60-day acceptance period will be corrected by the transferring party.

C. When transferring documents in electronic media format, the transferring party makes no representations as to long term compatibility, usability, or readability of documents resulting

from the use of software application packages, operating systems, or computer hardware differing from those used by the data's creator.

PART 4 - AVAILABILITY OF LANDS; SUBSURFACE AND PHYSICAL CONDITIONS; HAZARDOUS ENVIRONMENTAL CONDITIONS; REFERENCE POINTS

4.01 Availability of Lands

A. Owner shall furnish the Site. Owner shall notify Contractor of any encumbrances or restrictions not of general application but specifically related to use of the Site with which Contractor must comply in performing the Work. Owner will obtain in a timely manner and pay for easements for permanent structures or permanent changes in existing facilities. If Contractor and Owner are unable to agree on entitlement to or on the amount or extent, if any, of any adjustment in the Contract Price or Contract Times, or both, as a result of any delay in Owner's furnishing the Site or a part thereof, Contractor may make a Claim therefor as provided in Paragraph 10.05.

B. Upon reasonable written request, Owner shall furnish Contractor with a current statement of record legal title and legal description of the lands upon which the Work is to be performed and Owner's interest therein as necessary for giving notice of or filing a mechanic's or construction lien against such lands in accordance with applicable Laws and Regulations.

C. Contractor shall provide for all additional lands and access thereto that may be required for temporary construction facilities or storage of materials and equipment.

4.02 Subsurface and Physical Conditions

A. Reports and Drawings: Reports of explorations and tests of subsurface conditions at or contiguous to the Site that Engineer has used in preparing the Bidding Documents including the Report of Geotechnical Exploration- City of Newberry Recreation Complex, Newberry Couth Carolina; S&ME Project No. 1461-17-025 completed for the project by S&ME, Inc. on October 26, 2017.

4.03 Differing Subsurface or Physical Conditions

A. Notice: If Contractor believes that any subsurface or physical condition at or contiguous to the Site that is uncovered or revealed either:

1. is of such a nature as to establish that any "technical data" on which Contractor is entitled to rely as provided in Paragraph 4.02 is materially inaccurate; or

2. is of such a nature as to require a change in the Contract Documents; or

3. differs materially from that shown or indicated in the Contract Documents; or

4 is of an unusual nature, and differs materially from conditions ordinarily encountered and generally recognized as inherent in work of the character provided for in the Contract Documents;

then Contractor shall, promptly after becoming aware thereof and before further disturbing the subsurface or physical conditions or performing any Work in connection therewith (except in an emergency as required by Paragraph 6.16.A), notify Owner and Engineer in writing about such condition. Contractor shall not further disturb such condition or perform any Work in connection therewith (except as aforesaid) until receipt of written order to do so.

B. Engineer's Review: After receipt of written notice as required by Paragraph 4.03.A, Engineer will promptly review the pertinent condition, determine the necessity of Owner's obtaining additional exploration or tests with respect thereto, and advise Owner in writing (with a copy to Contractor) of Engineer's findings and conclusions.

C. Possible Price and Times Adjustments

1. The Contract Price or the Contract Times, or both, will be equitably adjusted to the extent that the existence of such differing subsurface or physical condition causes an increase or decrease in Contractor's cost of, or time required for, performance of the Work; subject, however, to the following:

a. such condition must meet any one or more of the categories described in Paragraph 4.03.A; and

b. with respect to Work that is paid for on a Unit Price Basis, any adjustment in Contract Price will be subject to the provisions of Paragraphs 9.07 and 11.03.

2. Contractor shall not be entitled to any adjustment in the Contract Price or Contract Times if:

a. Contractor knew of the existence of such conditions at the time Contractor made a final commitment to Owner with respect to Contract Price and Contract Times by the submission of a Bid or becoming bound under a negotiated contract; or

b. the existence of such condition could reasonably have been discovered or revealed as a result of any examination, investigation, exploration, test, or study of the Site and contiguous areas required by the Bidding Requirements or Contract Documents to be conducted by or for Contractor prior to Contractor's making such final commitment; or

c. Contractor failed to give the written notice as required by Paragraph 4.03.A.

3. If Owner and Contractor are unable to agree on entitlement to or on the amount or extent, if any, of any adjustment in the Contract Price or Contract Times, or both, a Claim may be made therefor as provided in Paragraph 10.05. However, Owner and Engineer, and any of their Related Entities shall not be liable to Contractor for any claims, costs, losses, or damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) sustained by Contractor on or in connection with any other project or anticipated project.

4.04 Underground Facilities

A. Shown or Indicated: The information and data shown or indicated in the Contract Documents with respect to existing Underground Facilities at or contiguous to the Site is based on information and data furnished to Owner or Engineer by the owners of such Underground Facilities, including Owner, or by others:

1. Owner and Engineer shall not be responsible for the accuracy or completeness of any such information or data; and

2. The cost of all of the following will be included in the Contract Price, and Contractor shall have full responsibility for:

    a. reviewing and checking all such information and data,

    b. locating all Underground Facilities shown or indicated in the Contract Documents,

    c. coordination of the Work with the owners of such Underground Facilities, including Owner, during construction, and
    d. the safety and protection of all such Underground Facilities and repairing any damage thereto resulting from the Work.

B. Not Shown or Indicated

1. If an Underground Facility is uncovered or revealed at or contiguous to the Site which was not shown or indicated, or not shown or indicated with reasonable accuracy in the Contract Documents, Contractor shall, promptly after becoming aware thereof and before further disturbing conditions affected thereby or performing any Work in connection therewith (except in an emergency as required by Paragraph 6.16.A), identify the owner of such Underground Facility and give written notice to that owner and to Owner and Engineer. Engineer will promptly review the Underground Facility and determine the extent, if any, to which a change is required in the Contract Documents to reflect and document the consequences of the existence or location of the Underground Facility. During such time, Contractor shall be responsible for the safety and protection of such Underground Facility.

2. If Engineer concludes that a change in the Contract Documents is required, a Work Change Directive or a Change Order will be issued to reflect and document such consequences. An equitable adjustment shall be made in the Contract Price or Contract Times, or both, to the extent that they are attributable to the existence or location of any Underground Facility that was not shown or indicated or not shown or indicated with reasonable accuracy in the Contract Documents and that Contractor did not know of and could not reasonably have been expected to be aware of or to have anticipated. If Owner and Contractor are unable to agree on entitlement to or on the amount or extent, if any, of any such adjustment in Contract Price or Contract Times, Owner or Contractor may make a Claim therefor as provided in Paragraph 10.05.

4.05 Reference Points

A. Owner shall provide engineering surveys to establish reference points for construction which in Engineer's judgment are necessary to enable Contractor to proceed with the Work. Contractor shall be responsible for laying out the Work, shall protect and preserve the established reference points and property monuments, and shall make no changes or relocations without the prior written approval of Owner. Contractor shall report to Engineer whenever any reference point or property monument is lost or destroyed or requires relocation because of necessary changes in grades or locations, and shall be responsible for the accurate replacement or relocation of such reference points or property monuments by professionally qualified personnel.

4.06 Hazardous Environmental Condition at Site

A. Reports and Drawings: No reports on drawings related to Hazardous Environmental Conditions are known to the Owner or Engineer.

B. Limited Reliance by Contractor on Technical Data Authorized: Not used.

PART 5 - BONDS AND INSURANCE

5.01 Performance, Payment, and Other Bonds

A. Contractor shall furnish performance and payment bonds, each in an amount at least equal to the Contract Price as security for the faithful performance and payment of all of Contractor's obligations under the Contract Documents. These bonds shall remain in effect until one year after the date when final payment becomes due or until completion of the correction period specified in Paragraph 13.07, whichever is later, except as provided otherwise by Laws or Regulations or by the Contract Documents. Contractor shall also furnish such other bonds as are required by the Contract Documents.

B. All bonds shall be in the form prescribed by the Contract Documents except as provided otherwise by Laws or Regulations, and shall be executed by such sureties as are named in the current list of "Companies Holding Certificates of Authority as Acceptable Sureties on Federal Bonds and as Acceptable Reinsuring Companies" as published in Circular 570 (amended) by the Financial Management Service, Surety Bond Branch, U.S. Department of the Treasury. All bonds signed by an agent must be accompanied by a certified copy of the agent's authority to act.

C. If the surety on any bond furnished by Contractor is declared bankrupt or becomes insolvent or its right to do business is terminated in any state where any part of the Project is located or it ceases to meet the requirements of Paragraph 5.01.B, Contractor shall promptly notify Owner and Engineer and shall, within 20 days after the event giving rise to such notification, provide another bond and surety, both of which shall comply with the requirements of Paragraphs 5.01.B and 5.02.

5.02 Licensed Sureties and Insurers

A. All bonds and insurance required by the Contract Documents to be purchased and maintained by Owner or Contractor shall be obtained from surety or insurance companies that are duly licensed or authorized in the jurisdiction in which the Project is located to issue bonds or insurance policies for the limits and coverages so required. Such surety and insurance companies shall also meet such additional requirements and qualifications.

5.03 Certificates of Insurance

A. Contractor shall deliver to Owner, with copies to each additional insured, certificates of insurance (and other evidence of insurance requested by Owner or any other additional insured) which Contractor is required to purchase and maintain.

B. Failure of Owner to demand such certificates or other evidence of full compliance with these insurance requirements or failure of Owner to identify a deficiency from evidence provided shall not be construed as a waiver of Contractor's obligation to maintain such insurance.

C. By requiring such insurance and insurance limits herein, Owner does not represent that coverage and limits will necessarily be adequate to protect contractor and such coverage and limits shall not be deemed as a limitation on Contractor's liability order the indemnities granted to Owner in the Contract Documents.

5.04 Contractor's Liability Insurance

A. Contractor shall purchase and maintain such liability and other insurance as is appropriate for the Work being performed and as will provide protection from claims set forth below which may arise out of or result from Contractor's performance of the Work and Contractor's other obligations under the Contract Documents, whether it is to be performed by Contractor, any Subcontractor or Supplier, or by anyone directly or indirectly employed by any of them to perform any of the Work, or by anyone for whose acts any of them may be liable:

1. claims under workers' compensation, disability benefits, and other similar employee benefit acts;

2. claims for damages because of bodily injury, occupational sickness or disease, or death of Contractor's employees;

3. claims for damages because of bodily injury, sickness or disease, or death of any person other than Contractor's employees;

4. claims for damages insured by reasonably available personal injury liability coverage which are sustained:

    a. by any person as a result of an offense directly or indirectly related to the employment of such person by Contractor, or

    b. by any other person for any other reason;

5. claims for damages, other than to the Work itself, because of injury to or destruction of tangible property wherever located, including loss of use resulting therefrom; and

6. claims for damages because of bodily injury or death of any person or property damage arising out of the ownership, maintenance or use of any motor vehicle.

B. The policies of insurance required by this Paragraph 5.04 shall:

1. with respect to insurance required by Paragraphs 5.04.A.3 through 5.04.A.6 inclusive, include as additional insured (subject to any customary exclusion regarding professional liability) Owner and Engineer, and any other individuals or entities, all of whom shall be listed as additional insureds, and include coverage for the respective officers, directors, partners, employees, agents, consultants and subcontractors of each and any of all such additional insureds, and the insurance afforded to these additional insureds shall provide primary coverage for all claims covered thereby;

2. include at least the specific coverages and be written for not less than the limits of liability provided or required by Laws or Regulations, whichever is greater;

3. include completed operations insurance;

4. include contractual liability insurance covering Contractor's indemnity obligations under Paragraphs 6.11 and 6.20;

5. contain a provision or endorsement that the coverage afforded will not be canceled, materially changed or renewal refused until at least 30 days prior written notice has been given to Owner and Contractor and to each other additional insured to whom a certificate of insurance has been issued (and the certificates of insurance furnished by the Contractor pursuant to Paragraph 5.03 will so provide);

6. remain in effect at least until final payment and at all times thereafter when Contractor may be correcting, removing, or replacing defective Work in accordance with Paragraph 13.07; and

7. with respect to completed operations insurance, and any insurance coverage written on a claims-made basis, remain in effect for at least two years after final payment.

    a. Contractor shall furnish Owner and each other additional insured to whom a certificate of insurance has been issued, evidence satisfactory to Owner and any such additional insured of continuation of such insurance at final payment and one year thereafter.

C. The limits of liability for the insurance required by Paragraph 5.04 of the General Conditions shall provide coverage for not less than the following amounts or greater where required by Laws and Regulations:

1. Workers' Compensation, and related coverages under Paragraphs 5.04.A.1 and A.2 of the General Conditions:

    a. State: South Carolina
    Statutory Benefits

    b. Applicable Federal (e.g., Longshoreman's): Statutory

    c. Employer's Liability:

Each Accident	$500,000
Disease–Policy Limit	$500,000
Disease-Each Employee	$500,000

2. Contractor's General Liability under Paragraphs 5.04.A.3 through A.6 of the General Conditions which shall include completed operations and product liability coverages and eliminate the exclusion with respect to property under the care, custody and control of Contractor and for this project only:

a. General Aggregate	$2,000,000
b. Products - Completed Operations Aggregate	$2,000,000
c. Personal and Advertising Injury	$1,000,000
d. Each Occurrence (Bodily Injury and Property Damage)	$1,000,000
e. Fire Damage (any one (1) fire)	$50,000
f. Medical Expense (any one (1) person)	$5,000

g. Property Damage liability insurance will provide Explosion, Collapse, and Underground coverages where applicable.

h. Excess or Umbrella Liability

1) General Aggregate	$2,000,000
2) Each Occurrence	$2,000,000

3. Automobile Liability under Paragraph 5.04.A.6 of the General Conditions:

a. Include coverage for all owned, hired and non-owned automobiles.
b. Combined Single Limit of $1,000,000

4. The Contractual Liability coverage required by Paragraph 5.04.B.4 of the General Conditions shall provide coverage for not less than the following amounts:

a. Bodily Injury:

Each Accident	$2,000,000
Annual Aggregate	$2,000,000

b. Property Damage:

Each Accident	$2,000,000
Annual Aggregate	$2,000,000

5. Flood Insurance: The Contractor is required to carry flood insurance for projects located in designated flood hazard areas in which Federal Flood Insurance is available.

5.05 Owner's Liability Insurance

A. In addition to the insurance required to be provided by Contractor under Paragraph 5.04, Owner, at Owner's option, may purchase and maintain at Owner's expense Owner's own liability insurance as will protect Owner against claims which may arise from operations under the Contract Documents.

5.06 Property Insurance

A. Contractor shall purchase and maintain property insurance upon the Work at the Site in the amount of the full replacement cost thereof.

1. This insurance shall:

a. include the interests of Owner, Contractor, Subcontractors, Engineer and any other individuals or entities identified herein, and the officers, directors, partners, employees, agents and other consultants and subcontractors of any of them each of whom is deemed to have an insurable interest and shall be listed as an insured or additional insured;

b. in addition to the individuals and entities specified, include as additional insureds, the following:
1) Newberry County

c. be written on a Builder's Risk "all-risk" or open peril or special causes of loss policy form that shall at least include insurance for physical loss and damage to the Work, temporary buildings, falsework, and materials and equipment in transit and shall insure against at least the following perils or causes of loss: fire, lightning, extended coverage, theft, vandalism and malicious mischief, earthquake, collapse, debris

removal, demolition occasioned by enforcement of Laws and Regulations, water damage (other than that caused by flood), and such other perils or causes of loss as may be specifically required;

d. include expenses incurred in the repair or replacement of any insured property (including but not limited to fees and charges of engineers and architects);

e. cover materials and equipment stored at the Site or at another location that was agreed to in writing by Owner prior to being incorporated in the Work, provided that such materials and equipment have been included in an Application for Payment recommended by Engineer;

f. allow for partial utilization of the Work by Owner;

g. include testing and startup; and

h. be maintained in effect until final payment is made unless otherwise agreed to in writing by Owner, Contractor and Engineer with 30 days written notice to each other additional insured to whom a certificate of insurance has been issued.

2. Contractor shall be responsible for any deductible or self-insured retention.

3. The policies of insurance required to be purchased and maintained by Contractor in accordance with this Paragraph SC-5.06.A shall comply with the requirements of paragraph 5.06.C of the General Conditions.

B. Owner shall purchase and maintain such boiler and machinery insurance or additional property insurance as may be required Laws and Regulations which will include the interests of Owner, Contractor, Subcontractors, and Engineer, and any other individuals or entities identified, and the officers, directors, partners, employees, agents, consultants and subcontractors of each and any of them, each of whom is deemed to have an insurable interest and shall be listed as an insured or additional insured.

C. All the policies of insurance (and the certificates or other evidence thereof) required to be purchased and maintained in accordance with Paragraph 5.06 will contain a provision or endorsement that the coverage afforded will not be canceled or materially changed or renewal refused until at least thirty (30) days prior written notice has been given to Owner and Contractor and to each other additional insured to whom a certificate of insurance has been issued and will contain waiver provisions in accordance with Paragraph 5.07.

D. Owner shall not be responsible for purchasing and maintaining any property insurance specified in this Paragraph 5.06 to protect the interests of Contractor, Subcontractors, or others in the Work to the extent of any deductible amounts that are identified. The risk of loss within such identified deductible amount will be borne by Contractor, Subcontractors, or others suffering any such loss, and if any of them wishes property insurance coverage within the limits of such amounts, each may purchase and maintain it at the purchaser's own expense.

5.07 Waiver of Rights

A. Owner and Contractor intend that all policies purchased in accordance with Paragraph 5.06 will protect Owner, Contractor, Subcontractors, and Engineer, and all other individuals or entities identified to be listed as insureds or additional insureds (and the officers, directors, partners, employees, agents, consultants and subcontractors of each and any of them) in such policies and will provide primary coverage for all losses and damages caused by the

perils or causes of loss covered thereby. All such policies shall contain provisions to the effect that in the event of payment of any loss or damage the insurers will have no rights of recovery against any of the insureds or additional insureds thereunder. Owner and Contractor waive all rights against each other and their respective officers, directors, partners, employees, agents, consultants and subcontractors of each and any of them for all losses and damages caused by, arising out of or resulting from any of the perils or causes of loss covered by such policies and any other property insurance applicable to the Work; and, in addition, waive all such rights against Subcontractors, and Engineer, and all other individuals or entities identified to be listed as insured or additional insured (and the officers, directors, partners, employees, agents, consultants and subcontractors of each and any of them) under such policies for losses and damages so caused. None of the above waivers shall extend to the rights that any party making such waiver may have to the proceeds of insurance held by Owner as trustee or otherwise payable under any policy so issued.

5.08 Receipt and Application of Insurance Proceeds

A. Any insured loss under the policies of insurance required by Paragraph 5.06 will be adjusted with Owner and made payable to Owner as fiduciary for the insureds, as their interests may appear, subject to the requirements of any applicable mortgage clause and of Paragraph 5.08.B. Owner shall deposit in a separate account any money so received and shall distribute it in accordance with such agreement as the parties in interest may reach. If no other special agreement is reached, the damaged Work shall be repaired or replaced, the moneys so received applied on account thereof, and the Work and the cost thereof covered by an appropriate Change Order.

B. Owner as fiduciary shall have power to adjust and settle any loss with the insurers unless one of the parties in interest shall object in writing within 15 days after the occurrence of loss to Owner's exercise of this power. If such objection be made, Owner as fiduciary shall make settlement with the insurers in accordance with such agreement as the parties in interest may reach. If no such agreement among the parties in interest is reached, Owner as fiduciary shall adjust and settle the loss with the insurers and, if required in writing by any party in interest, Owner as fiduciary shall give bond for the proper performance of such duties.

5.09 Acceptance of Bonds and Insurance; Option to Replace

A. If either Owner or Contractor has any objection to the coverage afforded by or other provisions of the bonds or insurance required to be purchased and maintained by the other party in accordance with Part 5 on the basis of nonconformance with the Contract Documents, the objecting party shall so notify the other party in writing within ten (10) days after receipt of the certificates (or other evidence requested) required by Paragraph 2.01.B. Owner and Contractor shall each provide to the other such additional information in respect of insurance provided as the other may reasonably request. If either party does not purchase or maintain all of the bonds and insurance required of such party by the Contract Documents, such party shall notify the other party in writing of such failure to purchase prior to the start of the Work, or of such failure to maintain prior to any change in the required coverage. Without prejudice to any other right or remedy, the other party may elect to obtain equivalent bonds or insurance to protect such other party's interests at the expense of the party who was required to provide such coverage, and a Change Order shall be issued to adjust the Contract Price accordingly.

5.10 Partial Utilization, Acknowledgment of Property Insurer

A. If Owner finds it necessary to occupy or use a portion or portions of the Work prior to Substantial Completion of all the Work as provided in Paragraph 14.05, no such use or occupancy shall commence before the insurers providing the property insurance pursuant to

Paragraph 5.06 have acknowledged notice thereof and in writing effected any changes in coverage necessitated thereby. The insurers providing the property insurance shall consent by endorsement on the policy or policies, but the property insurance shall not be canceled or permitted to lapse on account of any such partial use or occupancy.

PART 6 - CONTRACTOR'S RESPONSIBILITIES

6.01 Supervision and Superintendence

A. Contractor shall supervise, inspect, and direct the Work competently and efficiently, devoting such attention thereto and applying such skills and expertise as may be necessary to perform the Work in accordance with the Contract Documents. Contractor shall be solely responsible for the means, methods, techniques, sequences, and procedures of construction. Contractor shall not be responsible for the negligence of Owner or Engineer in the design or specification of a specific means, method, technique, sequence, or procedure of construction which is shown or indicated in and expressly required by the Contract Documents.

B. At all times during the progress of the Work, Contractor shall assign a competent resident superintendent who shall not be replaced without written notice to Owner and Engineer except under extraordinary circumstances. The superintendent will be Contractor's representative at the Site and shall have authority to act on behalf of Contractor. All communications given to or received from the superintendent shall be binding on Contractor.

6.02 Labor; Working Hours

A. Contractor shall provide competent, suitably qualified personnel to survey and lay out the Work and perform construction as required by the Contract Documents. Contractor shall at all times maintain good discipline and order at the Site.

B. Except as otherwise required for the safety or protection of persons or the Work or property at the Site or adjacent thereto, and except as otherwise stated in the Contract Documents, all Work at the Site shall be performed during regular working hours. Contractor will not permit the performance of Work on a Saturday, Sunday, or any legal holiday without Owner's written consent (which will not be unreasonably withheld) given after prior written notice to Engineer.

6.03 Services, Materials, and Equipment

A. Unless otherwise specified in the Contract Documents, Contractor shall provide and assume full responsibility for all services, materials, equipment, labor, transportation, construction equipment and machinery, tools, appliances, fuel, power, light, heat, telephone, water, sanitary facilities, temporary facilities, and all other facilities and incidentals necessary for the performance, testing, startup, and completion of the Work.

B. All materials and equipment incorporated into the Work shall be as specified or, if not specified, shall be of good quality and new, except as otherwise provided in the Contract Documents. All special warranties and guarantees required by the Specifications shall expressly run to the benefit of Owner. If required by Engineer, Contractor shall furnish satisfactory evidence (including reports of required tests) as to the source, kind, and quality of materials and equipment.

C. All materials and equipment shall be stored, applied, installed, connected, erected, protected, used, cleaned, and conditioned in accordance with instructions of the applicable Supplier, except as otherwise may be provided in the Contract Documents.

6.04 Progress Schedule

A. Contractor shall adhere to the Progress Schedule established in accordance with Paragraph 2.07 as it may be adjusted from time to time as provided below.

1. Contractor shall submit to Engineer for acceptance (to the extent indicated in Paragraph 2.07) proposed adjustments in the Progress Schedule that will not result in changing the Contract Times. Such adjustments will comply with any provisions of the General Requirements applicable thereto.

2. Proposed adjustments in the Progress Schedule that will change the Contract Times shall be submitted in accordance with the requirements of Part 12. Adjustments in Contract Times may only be made by a Change Order.

6.05 Substitutes and "Or-Equals"

A. Whenever an item of material or equipment is specified or described in the Contract Documents by using the name of a proprietary item or the name of a particular Supplier, the specification or description is intended to establish the type, function, appearance, and quality required. Unless the specification or description contains or is followed by words reading that no like, equivalent, or "or-equal" item or no substitution is permitted, other items of material or equipment or material or equipment of other Suppliers may be submitted to Engineer for review under the circumstances described below.

1. "Or-Equal" Items: If in Engineer's sole discretion an item of material or equipment proposed by Contractor is functionally equal to that named and sufficiently similar so that no change in related Work will be required, it may be considered by Engineer as an "or-equal" item, in which case review and approval of the proposed item may, in Engineer's sole discretion, be accomplished without compliance with some or all of the requirements for approval of proposed substitute items. For the purposes of this Paragraph 6.05.A.1, a proposed item of material or equipment will be considered functionally equal to an item so named if:

a. in the exercise of reasonable judgment Engineer determines that:

1) it is at least equal in materials of construction, quality, durability, appearance, strength, and design characteristics;

2) it will reliably perform at least equally well the function and achieve the results imposed by the design concept of the completed Project as a functioning whole,

3) it has a proven record of performance and availability of responsive service; and

b. Contractor certifies that, if approved and incorporated into the Work:

1) there will be no increase in cost to the Owner or increase in Contract Times, and

2) it will conform substantially to the detailed requirements of the item named in the Contract Documents.

2. Substitute Items

a. If in Engineer's sole discretion an item of material or equipment proposed by Contractor does not qualify as an "or-equal" item under Paragraph 6.05.A.1, it will be considered a proposed substitute item.

b Contractor shall submit sufficient information as provided below to allow Engineer to determine that the item of material or equipment proposed is essentially equivalent to that named and an acceptable substitute therefor. Requests for review of proposed substitute items of material or equipment will not be accepted by Engineer from anyone other than Contractor.

c. The requirements for review by Engineer will be as set forth in Paragraph 6.05.A.2.d, as supplemented in the General Requirements and as Engineer may decide is appropriate under the circumstances.

d. Contractor shall make written application to Engineer for review of a proposed substitute item of material or equipment that Contractor seeks to furnish or use. The application:

1) shall certify that the proposed substitute item will:

a) perform adequately the functions and achieve the results called for by the general design,

b) be similar in substance to that specified, and

c) be suited to the same use as that specified;

2) will state:

a) the extent, if any, to which the use of the proposed substitute item will prejudice Contractor's achievement of Substantial Completion on time;

b) whether or not use of the proposed substitute item in the Work will require a change in any of the Contract Documents (or in the provisions of any other direct contract with Owner for other work on the Project) to adapt the design to the proposed substitute item; and

c) whether or not incorporation or use of the proposed substitute item in connection with the Work is subject to payment of any license fee or royalty;

3) will identify:

a) all variations of the proposed substitute item from that specified, and

b) available engineering, sales, maintenance, repair, and replacement services;

4) and shall contain an itemized estimate of all costs or credits that will result directly or indirectly from use of such substitute item, including costs of redesign and claims of other contractors affected by any resulting change,

B. Substitute Construction Methods or Procedures: If a specific means, method, technique, sequence, or procedure of construction is expressly required by the Contract Documents, Contractor may furnish or utilize a substitute means, method, technique, sequence, or procedure of construction approved by Engineer. Contractor shall submit sufficient information to allow Engineer, in Engineer's sole discretion, to determine that the substitute proposed is equivalent to that expressly called for by the Contract Documents. The requirements for review by Engineer will be similar to those provided in Paragraph 6.05.A.2.

C. Engineer's Evaluation: Engineer will be allowed a reasonable time within which to evaluate each proposal or submittal made pursuant to Paragraphs 6.05.A and 6.05.B. Engineer may require Contractor to furnish additional data about the proposed substitute item. Engineer will be the sole judge of acceptability. No "or equal" or substitute will be ordered, installed or utilized until Engineer's review is complete, which will be evidenced by either a Change Order for a substitute or an approved Shop Drawing for an "or-equal." Engineer will advise Contractor in writing of any negative determination.

D. Special Guarantee: Owner may require Contractor to furnish at Contractor's expense a special performance guarantee or other surety with respect to any substitute.

E. Engineer's Cost Reimbursement: Engineer will record Engineer's costs in evaluating a substitute proposed or submitted by Contractor pursuant to Paragraphs 6.05.A.2 and 6.05.B Whether or not Engineer approves a substitute item so proposed or submitted by Contractor, Contractor shall reimburse Owner for the charges of Engineer for evaluating each such proposed substitute. Contractor shall also reimburse Owner for the charges of Engineer for making changes in the Contract Documents (or in the provisions of any other direct contract with Owner) resulting from the acceptance of each proposed substitute.

F. Contractor's Expense: Contractor shall provide all data in support of any proposed substitute or "or-equal" at Contractor's expense.

6.06 Concerning Subcontractors, Suppliers, and Others

A. Contractor shall not employ any Subcontractor, Supplier, or other individual or entity (including those acceptable to Owner as indicated in Paragraph 6.06.B), whether initially or as a replacement, against whom Owner may have reasonable objection. Contractor shall not be required to employ any Subcontractor, Supplier, or other individual or entity to furnish or perform any of the Work against whom Contractor has reasonable objection.

B. The identity of certain Subcontractors, Suppliers, or other individuals or entities to be submitted to Owner in advance for acceptance by Owner by a specified date prior to the Effective Date of the Agreement, and if Contractor has submitted a list thereof, Owner's acceptance (either in writing or by failing to make written objection thereto by the date indicated for acceptance or objection in the Bidding Documents or the Contract Documents) of any such Subcontractor, Supplier, or other individual or entity so identified may be revoked on the basis of reasonable objection after due investigation. Contractor shall submit an acceptable replacement for the rejected Subcontractor, Supplier, or other individual or entity, and the Contract Price will be adjusted by the difference in the cost occasioned by such replacement, and an appropriate Change Order will be issued. No acceptance by Owner of any such Subcontractor, Supplier, or other individual or entity, whether initially or as a replacement, shall constitute a waiver of any right of Owner or Engineer to reject defective Work.

C. Contractor shall be fully responsible to Owner and Engineer for all acts and omissions of the Subcontractors, Suppliers, and other individuals or entities performing or furnishing any of the Work just as Contractor is responsible for Contractor's own acts and omissions. Nothing in the Contract Documents:

1. shall create for the benefit of any such Subcontractor, Supplier, or other individual or entity any contractual relationship between Owner or Engineer and any such Subcontractor, Supplier or other individual or entity, nor

2. shall anything in the Contract Documents create any obligation on the part of Owner or Engineer to pay or to see to the payment of any moneys due any such Subcontractor, Supplier, or other individual or entity except as may otherwise be required by Laws and Regulations.

D. Contractor shall be solely responsible for scheduling and coordinating the Work of Subcontractors, Suppliers, and other individuals or entities performing or furnishing any of the Work under a direct or indirect contract with Contractor.

E. Contractor shall require all Subcontractors, Suppliers, and such other individuals or entities performing or furnishing any of the Work to communicate with Engineer through Contractor.

F. The divisions and sections of the Specifications and the identifications of any Drawings shall not control Contractor in dividing the Work among Subcontractors or Suppliers or delineating the Work to be performed by any specific trade.

G. All Work performed for Contractor by a Subcontractor or Supplier will be pursuant to an appropriate agreement between Contractor and the Subcontractor or Supplier which specifically binds the Subcontractor or Supplier to the applicable terms and conditions of the Contract Documents for the benefit of Owner and Engineer. Whenever any such agreement is with a Subcontractor or Supplier who is listed as an additional insured on the property insurance provided in Paragraph 5.06, the agreement between the Contractor and the Subcontractor or Supplier will contain provisions whereby the Subcontractor or Supplier waives all rights against Owner, Contractor, and Engineer,, and all other individuals or entities to be listed as insureds or additional insureds (and the officers, directors, partners, employees, agents, consultants and subcontractors of each and any of them) for all losses and damages caused by, arising out of, relating to, or resulting from any of the perils or causes of loss covered by such policies and any other property insurance applicable to the Work. If the insurers on any such policies require separate waiver forms to be signed by any Subcontractor or Supplier, Contractor will obtain the same.

H. Owner or Engineer may furnish to any Subcontractor or Supplier, to the extent practicable, information about amounts paid to Contractor on account of Work performed for Contractor by a particular Subcontractor or Supplier.

6.07 Patent Fees and Royalties

A. Contractor shall pay all license fees and royalties and assume all costs incident to the use in the performance of the Work or the incorporation in the Work of any invention, design, process, product, or device which is the subject of patent rights or copyrights held by others. If a particular invention, design, process, product, or device is specified in the Contract Documents for use in the performance of the Work and if to the actual knowledge of Owner or Engineer its use is subject to patent rights or copyrights calling for the payment of any license fee or royalty to others, the existence of such rights shall be disclosed by Owner in the Contract Documents.

B. To the fullest extent permitted by Laws and Regulations, Contractor shall indemnify and hold harmless Owner and Engineer, and the officers, directors, partners, employees, agents, consultants and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to any infringement of patent rights or copyrights incident to the use in the performance of the Work or resulting from the incorporation in the Work of any invention, design, process, product, or device not specified in the Contract Documents.

6.08 Permits

A. Contractor shall obtain and pay for all construction permits and licenses. Owner shall assist Contractor, when necessary, in obtaining such permits and licenses. Contractor shall pay all governmental charges and inspection fees necessary for the prosecution of the Work which are applicable at the time of opening of Bids, or, if there are no Bids, on the Effective Date of the Agreement. Owner shall pay all charges of utility owners for connections for providing permanent service to the Work.

6.09 Laws and Regulations

A. Contractor shall give all notices required by and shall comply with all Laws and Regulations applicable to the performance of the Work. Except where otherwise expressly required by applicable Laws and Regulations, neither Owner nor Engineer shall be responsible for monitoring Contractor's compliance with any Laws or Regulations.

B. If Contractor performs any Work knowing or having reason to know that it is contrary to Laws or Regulations, Contractor shall bear all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such Work. However, it shall not be Contractor's primary responsibility to make certain that the Specifications and Drawings are in accordance with Laws and Regulations, but this shall not relieve Contractor of Contractor's obligations under Paragraph 3.03.

C. Changes in Laws or Regulations not known at the time of opening of Bids (or, on the Effective Date of the Agreement if there were no Bids) having an effect on the cost or time of performance of the Work shall be the subject of an adjustment in Contract Price or Contract Times. If Owner and Contractor are unable to agree on entitlement to or on the amount or extent, if any, of any such adjustment, a Claim may be made therefor as provided in Paragraph 10.05.

6.10 Taxes

A. Contractor shall pay all sales, consumer, use, and other similar taxes required to be paid by Contractor in accordance with the Laws and Regulations of the place of the Project which are applicable during the performance of the Work.

6.11 Use of Site and Other Areas

A. Limitation on Use of Site and Other Areas

1. Contractor shall confine construction equipment, the storage of materials and equipment, and the operations of workers to the Site and other areas permitted by Laws and Regulations, and shall not unreasonably encumber the Site and other areas with construction equipment or other materials or equipment. Contractor shall assume full responsibility for any damage to any such land or area, or to the owner or occupant thereof, or of any adjacent land or areas resulting from the performance of the Work.

2. Should any claim be made by any such owner or occupant because of the performance of the Work, Contractor shall promptly settle with such other party by negotiation or otherwise resolve the claim by arbitration or other dispute resolution proceeding or at law.

3. To the fullest extent permitted by Laws and Regulations, Contractor shall indemnify and hold harmless Owner and Engineer, and the officers, directors, partners, employees,

agents, consultants and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to any claim or action, legal or equitable, brought by any such owner or occupant against Owner, Engineer, or any other party indemnified hereunder to the extent caused by or based upon Contractor's performance of the Work.

B. *Removal of Debris During Performance of the Work:* During the progress of the Work Contractor shall keep the Site and other areas free from accumulations of waste materials, rubbish, and other debris. Removal and disposal of such waste materials, rubbish, and other debris shall conform to applicable Laws and Regulations.

C. *Cleaning:* Prior to Substantial Completion of the Work Contractor shall clean the Site and the Work and make it ready for utilization by Owner. At the completion of the Work Contractor shall remove from the Site all tools, appliances, construction equipment and machinery, and surplus materials and shall restore to original condition all property not designated for alteration by the Contract Documents.

D. *Loading Structures:* Contractor shall not load nor permit any part of any structure to be loaded in any manner that will endanger the structure, nor shall Contractor subject any part of the Work or adjacent property to stresses or pressures that will endanger it.

6.12 Record Documents

A. Contractor shall maintain in a safe place at the Site one record copy of all Drawings, Specifications, Addenda, Change Orders, Work Change Directives, Field Orders, and written interpretations and clarifications in good order and annotated to show changes made during construction. These record documents together with all approved Samples and a counterpart of all approved Shop Drawings will be available to Engineer for reference. Upon completion of the Work, these record documents, Samples, and Shop Drawings will be delivered to Engineer for Owner.

6.13 Safety and Protection

A. Contractor shall be solely responsible for initiating, maintaining and supervising all safety precautions and programs in connection with the Work. Contractor shall take all necessary precautions for the safety of, and shall provide the necessary protection to prevent damage, injury or loss to:

1. all persons on the Site or who may be affected by the Work;

2. all the Work and materials and equipment to be incorporated therein, whether in storage on or off the Site; and

3. other property at the Site or adjacent thereto, including trees, shrubs, lawns, walks, pavements, roadways, structures, utilities, and Underground Facilities not designated for removal, relocation, or replacement in the course of construction.

B. Contractor shall comply with all applicable Laws and Regulations relating to the safety of persons or property, or to the protection of persons or property from damage, injury, or loss; and shall erect and maintain all necessary safeguards for such safety and protection. Contractor shall notify owners of adjacent property and of Underground Facilities and other utility owners when prosecution of the Work may affect them, and shall cooperate with them in the protection, removal, relocation, and replacement of their property.

C. All damage, injury, or loss to any property referred to in Paragraph 6.13.A.2 or 6.13.A.3 caused, directly or indirectly, in whole or in part, by Contractor, any Subcontractor, Supplier, or any other individual or entity directly or indirectly employed by any of them to perform any of the Work, or anyone for whose acts any of them may be liable, shall be remedied by Contractor (except damage or loss attributable to the fault of Drawings or Specifications or to the acts or omissions of Owner or Engineer or , or anyone employed by any of them, or anyone for whose acts any of them may be liable, and not attributable, directly or indirectly, in whole or in part, to the fault or negligence of Contractor or any Subcontractor, Supplier, or other individual or entity directly or indirectly employed by any of them).

D. Contractor's duties and responsibilities for safety and for protection of the Work shall continue until such time as all the Work is completed and Engineer has issued a notice to Owner and Contractor in accordance with Paragraph 14.07.B that the Work is acceptable (except as otherwise expressly provided in connection with Substantial Completion).

6.14 Safety Representative

A. Contractor shall designate a qualified and experienced safety representative at the Site whose duties and responsibilities shall be the prevention of accidents and the maintaining and supervising of safety precautions and programs.

6.15 Hazard Communication Programs

A. Contractor shall be responsible for coordinating any exchange of material safety data sheets or other hazard communication information required to be made available to or exchanged between or among employers at the Site in accordance with Laws or Regulations.

6.16 Emergencies

A. In emergencies affecting the safety or protection of persons or the Work or property at the Site or adjacent thereto, Contractor is obligated to act to prevent threatened damage, injury, or loss. Contractor shall give Engineer prompt written notice if Contractor believes that any significant changes in the Work or variations from the Contract Documents have been caused thereby or are required as a result thereof. If Engineer determines that a change in the Contract Documents is required because of the action taken by Contractor in response to such an emergency, a Work Change Directive or Change Order will be issued.

6.17 Shop Drawings and Samples

A. Contractor shall submit Shop Drawings and Samples to Engineer for review and approval in accordance with the acceptable Schedule of Submittals (as required by Paragraph 2.07). Each submittal will be identified as Engineer may require.

1. Shop Drawings

a. Submit number of copies specified in the General Requirements.

b. Data shown on the Shop Drawings will be complete with respect to quantities, dimensions, specified performance and design criteria, materials, and similar data to show Engineer the services, materials, and equipment Contractor proposes to provide and to enable Engineer to review the information for the limited purposes required by Paragraph 6.17.D.

2. Samples: Contractor shall also submit Samples to Engineer for review and approval in accordance with the acceptable schedule of Shop Drawings and Sample submittals.

    a. Submit number of Samples specified in the Specifications.

    b. Clearly identify each Sample as to material, Supplier, pertinent data such as catalog numbers, the use for which intended and other data as Engineer may require to enable Engineer to review the submittal for the limited purposes required by Paragraph 6.17.D.

B. Where a Shop Drawing or Sample is required by the Contract Documents or the Schedule of Submittals, any related Work performed prior to Engineer's review and approval of the pertinent submittal will be at the sole expense and responsibility of Contractor.

C. Submittal Procedures

1. Before submitting each Shop Drawing or Sample, Contractor shall have determined and verified:

    a. all field measurements, quantities, dimensions, specified performance and design criteria, installation requirements, materials, catalog numbers, and similar information with respect thereto;

    b. the suitability of all materials with respect to intended use, fabrication, shipping, handling, storage, assembly, and installation pertaining to the performance of the Work;

    c. all information relative to Contractor's responsibilities for means, methods, techniques, sequences, and procedures of construction, and safety precautions and programs incident thereto; and

    d. shall also have reviewed and coordinated each Shop Drawing or Sample with other Shop Drawings and Samples and with the requirements of the Work and the Contract Documents.

2. Each submittal shall bear a stamp or specific written certification that Contractor has satisfied Contractor's obligations under the Contract Documents with respect to Contractor's review and approval of that submittal.

3. With each submittal, Contractor shall give Engineer specific written notice of any variations, that the Shop Drawing or Sample may have from the requirements of the Contract Documents. This notice shall be both a written communication separate from the Shop Drawing's or Sample Submittal; and, in addition, by a specific notation made on each Shop Drawing or Sample submitted to Engineer for review and approval of each such variation.

D. Engineer's Review

1. Engineer will provide timely review of Shop Drawings and Samples in accordance with the Schedule of Submittals acceptable to Engineer. Engineer's review and approval will be only to determine if the items covered by the submittals will, after installation or incorporation in the Work, conform to the information given in the Contract Documents and be compatible with the design concept of the completed Project as a functioning whole as indicated by the Contract Documents.

2. Engineer's review and approval will not extend to means, methods, techniques, sequences, or procedures of construction (except where a particular means, method, technique, sequence, or procedure of construction is specifically and expressly called for by the Contract Documents) or to safety precautions or programs incident thereto. The review and approval of a separate item as such will not indicate approval of the assembly in which the item functions.

3. Engineer's review and approval shall not relieve Contractor from responsibility for any variation from the requirements of the Contract Documents unless Contractor has complied with the requirements of Paragraph 6.17.C.3 and Engineer has given written approval of each such variation by specific written notation thereof incorporated in or accompanying the Shop Drawing or Sample. Engineer's review and approval shall not relieve Contractor from responsibility for complying with the requirements of Paragraph 6.17.C.1.

E. Resubmittal Procedures

1. Contractor shall make corrections required by Engineer and shall return the required number of corrected copies of Shop Drawings and submit, as required, new Samples for review and approval. Contractor shall direct specific attention in writing to revisions other than the corrections called for by Engineer on previous submittals.

F. Contractor shall furnish required submittals with sufficient information and accuracy in order to obtain required approval of an item with no more than three (3) submittals. Engineer will record Engineer's time for reviewing subsequent submittals of Shop Drawings, samples or other items requiring approval and Contractor shall reimburse Owner for Engineer's charges for such time.

G. In the event that Contractor requests a substitution for a previously approved item, Contractor shall reimburse Owner for Engineer's charges for such time unless the need for such substitution is beyond the control of Contractor.

6.18 Continuing the Work

A. Contractor shall carry on the Work and adhere to the Progress Schedule during all disputes or disagreements with Owner. No Work shall be delayed or postponed pending resolution of any disputes or disagreements, except as permitted by Paragraph 15.04 or as Owner and Contractor may otherwise agree in writing.

6.19 Contractor's General Warranty and Guarantee

A. Contractor warrants and guarantees to Owner that all Work will be in accordance with the Contract Documents and will not be defective. Engineer and its Related Entities shall be entitled to rely on representation of Contractor's warranty and guarantee.

B. Contractor's warranty and guarantee hereunder excludes defects or damage caused by:

1. abuse, modification, or improper maintenance or operation by persons other than Contractor, Subcontractors, Suppliers, or any other individual or entity for whom Contractor is responsible; or

2. normal wear and tear under normal usage.

C. Contractor's obligation to perform and complete the Work in accordance with the Contract Documents shall be absolute. None of the following will constitute an acceptance of Work that is not in accordance with the Contract Documents or a release of Contractor's obligation to perform the Work in accordance with the Contract Documents:

1. observations by Engineer;

2. recommendation by Engineer or payment by Owner of any progress or final payment;

3. the issuance of a certificate of Substantial Completion by Engineer or any payment related thereto by Owner;

4. use or occupancy of the Work or any part thereof by Owner;

5. any review and approval of a Shop Drawing or Sample submittal or the issuance of a notice of acceptability by Engineer;

6. any inspection, test, or approval by others; or

7. any correction of defective Work by Owner.

D. The Contractor's General Warranty and Guarantee shall be for a period of one (1) year after work has been accepted and final payment made to the Contractor. In the case of Water and Wastewater lines, the warranty period will start after acceptance of these lines into the utility provider's system for ownership, operation, and maintenance. The Contractor accepts the transference of all warranties and guarantees to the utility provider owning and operating the new lines.

6.20 Indemnification

A. To the fullest extent permitted by Laws and Regulations, Contractor shall indemnify and hold harmless Owner and Engineer, and the officers, directors, partners, employees, agents, consultants and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to the performance of the Work, provided that any such claim, cost, loss, or damage is attributable to bodily injury, sickness, disease, or death, or to injury to or destruction of tangible property (other than the Work itself), including the loss of use resulting therefrom but only to the extent caused by any negligent act or omission of Contractor, any Subcontractor, any Supplier, or any individual or entity directly or indirectly employed by any of them to perform any of the Work or anyone for whose acts any of them may be liable .

B. In any and all claims against Owner or Engineer or any of their respective consultants, agents, officers, directors, partners, or employees by any employee (or the survivor or personal representative of such employee) of Contractor, any Subcontractor, any Supplier, or any individual or entity directly or indirectly employed by any of them to perform any of the Work, or anyone for whose acts any of them may be liable, the indemnification obligation under Paragraph 6.20.A shall not be limited in any way by any limitation on the amount or type of damages, compensation, or benefits payable by or for Contractor or any such Subcontractor, Supplier, or other individual or entity under workers' compensation acts, disability benefit acts, or other employee benefit acts.

C. The indemnification obligations of Contractor under Paragraph 6.20.A shall not extend to the liability of Engineer and Engineer's officers, directors, partners, employees, agents, consultants and subcontractors arising out of:

1. the preparation or approval of, or the failure to prepare or approve, maps, Drawings, opinions, reports, surveys, Change Orders, designs, or Specifications; or

2. giving directions or instructions, or failing to give them, if that is the primary cause of the injury or damage.

6.21 Delegation of Professional Design Services

A. Contractor will not be required to provide professional design services unless such services are specifically required by the Contract Documents for a portion of the Work or unless such services are required to carry out Contractor's responsibilities for construction means, methods, techniques, sequences and procedures. Contractor shall not be required to provide professional services in violation of applicable law.

B. If professional design services or certifications by a design professional related to systems, materials or equipment are specifically required of Contractor by the Contract Documents, Owner and Engineer will specify all performance and design criteria that such services must satisfy. Contractor shall cause such services or certifications to be provided by a properly licensed professional, whose signature and seal shall appear on all drawings, calculations, specifications, certifications, Shop Drawings and other submittals prepared by such professional. Shop Drawings and other submittals related to the Work designed or certified by such professional, if prepared by others, shall bear such professional's written approval when submitted to Engineer.

C. Owner and Engineer shall be entitled to rely upon the adequacy, accuracy and completeness of the services, certifications or approvals performed by such design professionals, provided Owner and Engineer have specified to Contractor all performance and design criteria that such services must satisfy.

D. Pursuant to this Paragraph 6.21, Engineer's review and approval of design calculations and design drawings will be only for the limited purpose of checking for conformance with performance and design criteria given and the design concept expressed in the Contract Documents. Engineer's review and approval of Shop Drawings and other submittals (except design calculations and design drawings) will be only for the purpose stated in Paragraph 6.17.D.1.

E. Contractor shall not be responsible for the adequacy of the performance or design criteria required by the Contract Documents.

PART 7 - OTHER WORK AT THE SITE

7.01 Related Work at Site

A. Owner may perform other work related to the Project at the Site with Owner's employees or via other direct contracts therefor, or have other work performed by utility owners. If such other work is not noted in the Contract Documents, then:

1. written notice thereof will be given to Contractor prior to starting any such other work; and

2. if Owner and Contractor are unable to agree on entitlement to or on the amount or extent, if any, of any adjustment in the Contract Price or Contract Times that should be allowed as a result of such other work, a Claim may be made therefor as provided in Paragraph 10.05.

B. Contractor shall afford each other contractor who is a party to such a direct contract, each utility owner and Owner, if Owner is performing other work with Owner's employees, proper and safe access to the Site, a reasonable opportunity for the introduction and storage of materials and equipment and the execution of such other work, and shall properly coordinate the Work with theirs. Contractor shall do all cutting, fitting, and patching of the Work that may be required to properly connect or otherwise make its several parts come together and properly integrate with such other work. Contractor shall not endanger any work of others by cutting, excavating, or otherwise altering their work and will only cut or alter their work with the written consent of Engineer and the others whose work will be affected. The duties and responsibilities of Contractor under this Paragraph are for the benefit of such utility owners and other contractors to the extent that there are comparable provisions for the benefit of Contractor in said direct contracts between Owner and such utility owners and other contractors.

C. If the proper execution or results of any part of Contractor's Work depends upon work performed by others under this Part 7, Contractor shall inspect such other work and promptly report to Engineer in writing any delays, defects, or deficiencies in such other work that render it unavailable or unsuitable for the proper execution and results of Contractor's Work. Contractor's failure to so report will constitute an acceptance of such other work as fit and proper for integration with Contractor's Work except for latent defects and deficiencies in such other work.

7.02 Coordination

A. If Owner intends to contract with others for the performance of other work on the Project at the Site, the following will be set forth:

1. the individual or entity who will have authority and responsibility for coordination of the activities among the various contractors will be identified;

2. the specific matters to be covered by such authority and responsibility will be itemized; and

3. the extent of such authority and responsibilities will be provided.

B. Owner shall have sole authority and responsibility for such coordination.

7.03 Legal Relationships

A. Paragraphs 7.01.A and 7.02 are not applicable for utilities not under the control of Owner.

B. Each other direct contract of Owner under Paragraph 7.01.A shall provide that the other contractor is liable to Owner and Contractor for the reasonable direct delay and disruption costs incurred by Contractor as a result of the other contractor's actions or inactions.

C. Contractor shall be liable to Owner and any other contractor for the reasonable direct delay and disruption costs incurred by such other contractor as a result of Contractor's action or inactions.

7.04 Claims Between Contractors

A. Should Contractor cause damage to the work or property of any other contractor at the Site, or should any claim arising out of Contractor's performance of the Work at the Site be made by any other contractor against Contractor, Owner, Engineer, or the construction coordinator, Contractor shall promptly attempt to settle with such other contractor by agreement, or to otherwise resolve the dispute by arbitration or at law.

B. Contractor shall, to the fullest extent permitted by Laws and Regulations, indemnify and hold harmless Owner, Engineer, the construction coordinator and the officers, directors, partners, employees, agents and other consultants and subcontractors of each and any of them from and against all claims, costs, losses and damages (including, but not limited to, fees and charges of engineers, architects, attorneys, and other professionals and court and arbitration costs) arising directly, indirectly or consequentially out of any action, legal or equitable, brought by any other contractor against Owner, Engineer, Engineer's Consultants, or the construction coordinator to the extent said claim is based on or arises out of Contractor's performance of the Work. Should another contractor cause damage to the Work or property of Contractor or should the performance of work by any other contractor at the Site give rise to any other Claim, Contractor shall not institute any action, legal or equitable, against Owner, Engineer, or the construction coordinator or permit any action against any of them to be maintained and continued in its name or for its benefit in any court or before any arbiter which seeks to impose liability on or to recover damages from Owner, Engineer, or the construction coordinator on account of any such damage or Claim.

C. If Contractor is delayed at any time in performing or furnishing Work by any act or neglect of another contractor, and Owner and Contractor are unable to agree as to the extent of any adjustment in Contract Times attributable thereto, Contractor may make a Claim for an extension of times in accordance with Part 12. An extension of the Contract Times shall be Contractor's exclusive remedy with respect to Owner, Engineer, and construction coordinator for any delay, disruption, interference, or hindrance caused by any other contractor. This paragraph does not prevent recovery from Owner, Engineer, or construction coordinator for activities that are their respective responsibilities.

PART 8 - OWNER'S RESPONSIBILITIES

8.01 Communications to Contractor

A. Except as otherwise provided in these General Conditions, Owner shall issue all communications to Contractor through Engineer.

8.02 Replacement of Engineer

A. In case of termination of the employment of Engineer, Owner shall appoint an engineer to whom Contractor makes no reasonable objection, whose status under the Contract Documents shall be that of the former Engineer.

8.03 Furnish Data

A. Owner shall promptly furnish the data required of Owner under the Contract Documents.

8.04 Pay When Due

A. Owner shall make payments to Contractor when they are due as provided in Paragraphs 14.02.C and 14.07.C.

8.05 Lands and Easements; Reports and Tests

A. Owner's duties in respect of providing lands and easements and providing engineering surveys to establish reference points are set forth in Paragraphs 4.01 and 4.05. Paragraph 4.02 refers to Owner's identifying and making available to Contractor copies of reports of explorations and tests of subsurface conditions and drawings of physical conditions in or relating to existing surface or subsurface structures at or contiguous to the Site that have been utilized by Engineer in preparing the Contract Documents.

8.06 Insurance

A. Owner's responsibilities, if any, in respect to purchasing and maintaining liability and property insurance are set forth in Part 5.

8.07 Change Orders

A. Owner is obligated to execute Change Orders as indicated in Paragraph 10.03.

8.08 Inspections, Tests, and Approvals

A. Owner's responsibility in respect to certain inspections, tests, and approvals is set forth in Paragraph 13.03.B.

8.09 Limitations on Owner's Responsibilities

A. The Owner shall not supervise, direct, or have control or authority over, nor be responsible for, Contractor's means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or for any failure of Contractor to comply with Laws and Regulations applicable to the performance of the Work. Owner will not be responsible for Contractor's failure to perform the Work in accordance with the Contract Documents.

8.10 Undisclosed Hazardous Environmental Condition

A. Owner's responsibility in respect to an undisclosed Hazardous Environmental Condition is set forth in Paragraph 4.06.

8.11 Evidence of Financial Arrangements

A. If and to the extent Owner has agreed to furnish Contractor reasonable evidence that financial arrangements have been made to satisfy Owner's obligations under the Contract Documents, Owner's responsibility in respect thereof will be as set forth.

B. On request of Contractor prior to the execution of any Change Order involving a significant increase in the Contract Price, Owner shall furnish to Contractor reasonable evidence that adequate financial arrangements have been made by Owner to enable Owner to fulfill the increased financial obligations to be undertaken by Owner as a result of such Change Order.

PART 9 - ENGINEER'S STATUS DURING CONSTRUCTION

9.01 Owner's Representative

A. Engineer will be Owner's representative during the construction period. The duties and responsibilities and the limitations of authority of Engineer as Owner's representative during

construction are set forth in the Contract Documents and will not be changed without written consent of Owner and Engineer.

9.02 Visits to Site

A. Engineer will make visits to the Site at intervals appropriate to the various stages of construction as Engineer deems necessary in order to observe as an experienced and qualified design professional the progress that has been made and the quality of the various aspects of Contractor's executed Work. Based on information obtained during such visits and observations, Engineer, for the benefit of Owner, will determine, in general, if the Work is proceeding in accordance with the Contract Documents. Engineer will not be required to make exhaustive or continuous inspections on the Site to check the quality or quantity of the Work. Engineer's efforts will be directed toward providing for Owner a greater degree of confidence that the completed Work will conform generally to the Contract Documents. On the basis of such visits and observations, Engineer will keep Owner informed of the progress of the Work and will endeavor to guard Owner against defective Work.

B. Engineer's visits and observations are subject to all the limitations on Engineer's authority and responsibility set forth in Paragraph 9.09. Particularly, but without limitation, during or as a result of Engineer's visits or observations of Contractor's Work Engineer will not supervise, direct, control, or have authority over or be responsible for Contractor's means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or for any failure of Contractor to comply with Laws and Regulations applicable to the performance of the Work.

9.03 Project Representative

A. If Owner and Engineer agree, Engineer will furnish a Resident Project Representative to assist Engineer in providing more extensive observation of the Work. The authority and responsibilities of any such Resident Project Representative and assistants will be as provided, and limitations on the responsibilities thereof will be as provided in Paragraph 9.09. If Owner designates another representative or agent to represent Owner at the Site who is not Engineer's consultant, agent or employee, the responsibilities and authority and limitations thereon of such other individual or entity will be as provided in Paragraph 9.09.

9.04 Authorized Variations in Work

A. Engineer may authorize minor variations in the Work from the requirements of the Contract Documents which do not involve an adjustment in the Contract Price or the Contract Times and are compatible with the design concept of the completed Project as a functioning whole as indicated by the Contract Documents. These may be accomplished by a Field Order and will be binding on Owner and also on Contractor, who shall perform the Work involved promptly. If Owner or Contractor believes that a Field Order justifies an adjustment in the Contract Price or Contract Times, or both, and the parties are unable to agree on entitlement to or on the amount or extent, if any, of any such adjustment, a Claim may be made therefor as provided in Paragraph 10.05.

9.05 Rejecting Defective Work

A. Engineer will have authority to reject Work which Engineer believes to be defective, or that Engineer believes will not produce a completed Project that conforms to the Contract Documents or that will prejudice the integrity of the design concept of the completed Project as a functioning whole as indicated by the Contract Documents. Engineer will also have authority to require special inspection or testing of the Work as provided in Paragraph 13.04, whether or not the Work is fabricated, installed, or completed.

9.06 Shop Drawings, Change Orders and Payments

A. In connection with Engineer's authority, and limitations thereof, as to Shop Drawings and Samples, see Paragraph 6.17.

B. In connection with Engineer's authority, and limitations thereof, as to design calculations and design drawings submitted in response to a delegation of professional design services, if any, see Paragraph 6.21.

C. In connection with Engineer's authority as to Change Orders, see Parts 10, 11, and 12.

D. In connection with Engineer's authority as to Applications for Payment, see Part 14.

9.07 Determinations for Unit Price Work

A. Engineer will determine the actual quantities and classifications of Unit Price Work performed by Contractor. Engineer will review with Contractor the Engineer's preliminary determinations on such matters before rendering a written decision thereon (by recommendation of an Application for Payment or otherwise). Engineer's written decision thereon will be final and binding (except as modified by Engineer to reflect changed factual conditions or more accurate data) upon Owner and Contractor, subject to the provisions of Paragraph 10.05.

9.08 Decisions on Requirements of Contract Documents and Acceptability of Work

A. Engineer will be the initial interpreter of the requirements of the Contract Documents and judge of the acceptability of the Work thereunder. All matters in question and other matters between Owner and Contractor arising prior to the date final payment is due relating to the acceptability of the Work, and the interpretation of the requirements of the Contract Documents pertaining to the performance of the Work, will be referred initially to Engineer in writing within 30 days of the event giving rise to the question

B. Engineer will, with reasonable promptness, render a written decision on the issue referred. If Owner or Contractor believe that any such decision entitles them to an adjustment in the Contract Price or Contract Times or both, a Claim may be made under Paragraph 10.05. The date of Engineer's decision shall be the date of the event giving rise to the issues referenced for the purposes of Paragraph 10.05.B.

C. Engineer's written decision on the issue referred will be final and binding on Owner and Contractor, subject to the provisions of Paragraph 10.05.

D. When functioning as interpreter and judge under this Paragraph 9.08, 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.

9.09 Limitations on Engineer's Authority and Responsibilities

A. Neither Engineer's authority or responsibility under this Part 9 or under any other provision of the Contract Documents nor any decision made by Engineer in good faith either to exercise or not exercise such authority or responsibility or the undertaking, exercise, or performance of any authority or responsibility by Engineer shall create, impose, or give rise to any duty in contract, tort, or otherwise owed by Engineer to Contractor, any Subcontractor, any Supplier, any other individual or entity, or to any surety for or employee or agent of any of them.

B. Engineer will not supervise, direct, control, or have authority over or be responsible for Contractor's means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or for any failure of Contractor to comply with Laws and Regulations applicable to the performance of the Work. Engineer will not be responsible for Contractor's failure to perform the Work in accordance with the Contract Documents.

C. Engineer will not be responsible for the acts or omissions of Contractor or of any Subcontractor, any Supplier, or of any other individual or entity performing any of the Work.

D. Engineer's review of the final Application for Payment and accompanying documentation and all maintenance and operating instructions, schedules, guarantees, bonds, certificates of inspection, tests and approvals, and other documentation required to be delivered by Paragraph 14.07.A will only be to determine generally that their content complies with the requirements of, and in the case of certificates of inspections, tests, and approvals that the results certified indicate compliance with the Contract Documents.

E. The limitations upon authority and responsibility set forth in this Paragraph 9.09 shall also apply to, the Resident Project Representative, if any, and assistants, if any.

PART 10 - CHANGES IN THE WORK; CLAIMS

10.01 Authorized Changes in the Work

A. Without invalidating the Contract and without notice to any surety, Owner may, at any time or from time to time, order additions, deletions, or revisions in the Work by a Change Order, or a Work Change Directive. Upon receipt of any such document, Contractor shall promptly proceed with the Work involved which will be performed under the applicable conditions of the Contract Documents (except as otherwise specifically provided).

B. If Owner and Contractor are unable to agree on entitlement to, or on the amount or extent, if any, of an adjustment in the Contract Price or Contract Times, or both, that should be allowed as a result of a Work Change Directive, a Claim may be made therefor as provided in Paragraph 10.05.

10.02 Unauthorized Changes in the Work

A. Contractor shall not be entitled to an increase in the Contract Price or an extension of the Contract Times with respect to any work performed that is not required by the Contract Documents as amended, modified, or supplemented as provided in Paragraph 3.04, except in the case of an emergency as provided in Paragraph 6.16 or in the case of uncovering Work as provided in Paragraph 13.04.B.

10.03 Execution of Change Orders

A. Owner and Contractor shall execute appropriate Change Orders recommended by Engineer covering:

1. changes in the Work which are: (i) ordered by Owner pursuant to Paragraph 10.01.A, (ii) required because of acceptance of defective Work under Paragraph 13.08.A or Owner's correction of defective Work under Paragraph 13.09, or (iii) agreed to by the parties;

2. changes in the Contract Price or Contract Times which are agreed to by the parties, including any undisputed sum or amount of time for Work actually performed in accordance with a Work Change Directive; and

3. changes in the Contract Price or Contract Times which embody the substance of any written decision rendered by Engineer pursuant to Paragraph 10.05; provided that, in lieu of executing any such Change Order, an appeal may be taken from any such decision in accordance with the provisions of the Contract Documents and applicable Laws and Regulations, but during any such appeal, Contractor shall carry on the Work and adhere to the Progress Schedule as provided in Paragraph 6.18.A.

10.04 Notification to Surety

A. If notice of any change affecting the general scope of the Work or the provisions of the Contract Documents (including, but not limited to, Contract Price or Contract Times) is required by the provisions of any bond to be given to a surety, the giving of any such notice will be Contractor's responsibility. The amount of each applicable bond will be adjusted to reflect the effect of any such change.

10.05 Claims

A. Engineer's Decision Required: All Claims, except those waived pursuant to Paragraph 14.09, shall be referred to the Engineer for decision. A decision by Engineer shall be required as a condition precedent to any exercise by Owner or Contractor of any rights or remedies either may otherwise have under the Contract Documents or by Laws and Regulations in respect of such Claims.

B. Notice: Written notice stating the general nature of each Claim shall be delivered by the claimant to Engineer and the other party to the Contract promptly (but in no event later than 30 days) after the start of the event giving rise thereto. The responsibility to substantiate a Claim shall rest with the party making the Claim. Notice of the amount or extent of the Claim, with supporting data shall be delivered to the Engineer and the other party to the Contract within 60 days after the start of such event (unless Engineer allows additional time for claimant to submit additional or more accurate data in support of such Claim). A Claim for an adjustment in Contract Price shall be prepared in accordance with the provisions of Paragraph 12.01.B. A Claim for an adjustment in Contract Time shall be prepared in accordance with the provisions of Paragraph 12.02.B. Each Claim shall be accompanied by claimant's written statement that the adjustment claimed is the entire adjustment to which the claimant believes it is entitled as a result of said event. The opposing party shall submit any response to Engineer and the claimant within 30 days after receipt of the claimant's last submittal (unless Engineer allows additional time).

C. Engineer's Action: Engineer will review each Claim and, within 30 days after receipt of the last submittal of the claimant or the last submittal of the opposing party, if any, take one of the following actions in writing:

1. deny the Claim in whole or in part,

2. approve the Claim, or

3. notify the parties that the Engineer is unable to resolve the Claim if, in the Engineer's sole discretion, it would be inappropriate for the Engineer to do so. For purposes of further resolution of the Claim, such notice shall be deemed a denial.

D. In the event that Engineer does not take action on a Claim within said 30 days, the Claim shall be deemed denied.

E. Engineer's written action under Paragraph 10.05.C or denial pursuant to Paragraphs 10.05.C.3 or 10.05.D will be final and binding upon Owner and Contractor, unless Owner or Contractor invoke the dispute resolution procedure set forth in Part 16 within 30 days of such action or denial.

F. No Claim for an adjustment in Contract Price or Contract Times will be valid if not submitted in accordance with this Paragraph 10.05.

PART 11 - COST OF THE WORK; ALLOWANCES; UNIT PRICE WORK

11.01 Cost of the Work

A. Costs Included: The term Cost of the Work means the sum of all costs, except those excluded in Paragraph 11.01.B, necessarily incurred and paid by Contractor in the proper performance of the Work. When the value of any Work covered by a Change Order or when a Claim for an adjustment in Contract Price is determined on the basis of Cost of the Work, the costs to be reimbursed to Contractor will be only those additional or incremental costs required because of the change in the Work or because of the event giving rise to the Claim. Except as otherwise may be agreed to in writing by Owner, such costs shall be in amounts no higher than those prevailing in the locality of the Project, shall include only the following items, and shall not include any of the costs itemized in Paragraph 11.01.B.

1. Payroll costs for employees in the direct employ of Contractor in the performance of the Work under schedules of job classifications agreed upon by Owner and Contractor. Such employees shall include, without limitation, superintendents, foremen, and other personnel employed full time at the Site. Payroll costs for employees not employed full time on the Work shall be apportioned on the basis of their time spent on the Work. Payroll costs shall include, but not be limited to, salaries and wages plus the cost of fringe benefits, which shall include social security contributions, unemployment, excise, and payroll taxes, workers' compensation, health and retirement benefits, bonuses, sick leave, vacation and holiday pay applicable thereto. The expenses of performing Work outside of regular working hours, on Saturday, Sunday, or legal holidays, shall be included in the above to the extent authorized by Owner.

2. Cost of all materials and equipment furnished and incorporated in the Work, including costs of transportation and storage thereof, and Suppliers' field services required in connection therewith. All cash discounts shall accrue to Contractor unless Owner deposits funds with Contractor with which to make payments, in which case the cash discounts shall accrue to Owner. All trade discounts, rebates and refunds and returns from sale of surplus materials and equipment shall accrue to Owner, and Contractor shall make provisions so that they may be obtained.

3. Payments made by Contractor to Subcontractors for Work performed by Subcontractors. If required by Owner, Contractor shall obtain competitive bids from subcontractors acceptable to Owner and Contractor and shall deliver such bids to Owner, who will then determine, with the advice of Engineer, which bids, if any, will be acceptable. If any subcontract provides that the Subcontractor is to be paid on the basis of Cost of the Work

plus a fee, the Subcontractor's Cost of the Work and fee shall be determined in the same manner as Contractor's Cost of the Work and fee as provided in this Paragraph 11.01.

4. Costs of special consultants (including but not limited to Engineers, architects, testing laboratories, surveyors, attorneys, and accountants) employed for services specifically related to the Work.

5. Supplemental costs including the following:

   a. The proportion of necessary transportation, travel, and subsistence expenses of Contractor's employees incurred in discharge of duties connected with the Work.

   b. Cost, including transportation and maintenance, of all materials, supplies, equipment, machinery, appliances, office, and temporary facilities at the Site, and hand tools not owned by the workers, which are consumed in the performance of the Work, and cost, less market value, of such items used but not consumed which remain the property of Contractor.

   c. Rentals of all construction equipment and machinery, and the parts thereof whether rented from Contractor or others in accordance with rental agreements approved by Owner with the advice of Engineer, and the costs of transportation, loading, unloading, assembly, dismantling, and removal thereof. All such costs shall be in accordance with the terms of said rental agreements. The rental of any such equipment, machinery, or parts shall cease when the use thereof is no longer necessary for the Work.

   d. Sales, consumer, use, and other similar taxes related to the Work, and for which Contractor is liable, imposed by Laws and Regulations.

   e. Deposits lost for causes other than negligence of Contractor, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable, and royalty payments and fees for permits and licenses.

   f. Losses and damages (and related expenses) caused by damage to the Work, not compensated by insurance or otherwise, sustained by Contractor in connection with the performance of the Work (except losses and damages within the deductible amounts of property insurance established in accordance with Paragraph 5.06.D), provided such losses and damages have resulted from causes other than the negligence of Contractor, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable. Such losses shall include settlements made with the written consent and approval of Owner. No such losses, damages, and expenses shall be included in the Cost of the Work for the purpose of determining Contractor's fee.

   g. The cost of utilities, fuel, and sanitary facilities at the Site.

   h. Minor expenses such as telegrams, long distance telephone calls, telephone service at the Site, expresses, and similar petty cash items in connection with the Work.

   i. The costs of premiums for all bonds and insurance Contractor is required by the Contract Documents to purchase and maintain.

B. Costs Excluded: The term Cost of the Work shall not include any of the following items:

1. Payroll costs and other compensation of Contractor's officers, executives, principals (of partnerships and sole proprietorships), general managers, safety managers, engineers, architects, estimators, attorneys, auditors, accountants, purchasing and contracting agents, expediters, timekeepers, clerks, and other personnel employed by Contractor, whether at the Site or in Contractor's principal or branch office for general administration of the Work and not specifically included in the agreed upon schedule of job classifications referred to in Paragraph 11.01.A.1 or specifically covered by Paragraph 11.01.A.4, all of which are to be considered administrative costs covered by the Contractor's fee.

2. Expenses of Contractor's principal and branch offices other than Contractor's office at the Site.

3. Any part of Contractor's capital expenses, including interest on Contractor's capital employed for the Work and charges against Contractor for delinquent payments.

4. Costs due to the negligence of Contractor, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable, including but not limited to, the correction of defective Work, disposal of materials or equipment wrongly supplied, and making good any damage to property.

5. Other overhead or general expense costs of any kind and the costs of any item not specifically and expressly included in Paragraphs 11.01.A and 11.01.B.

C. Contractor's Fee: When all the Work is performed on the basis of cost-plus, Contractor's fee shall be determined as set forth in the Agreement. When the value of any Work covered by a Change Order or when a Claim for an adjustment in Contract Price is determined on the basis of Cost of the Work, Contractor's fee shall be determined as set forth in Paragraph 12.01.C.

D. Documentation: Whenever the Cost of the Work for any purpose is to be determined pursuant to Paragraphs 11.01.A and 11.01.B, Contractor will establish and maintain records thereof in accordance with generally accepted accounting practices and submit in a form acceptable to Engineer an itemized cost breakdown together with supporting data.

11.02 Allowances

A. It is understood that Contractor has included in the Contract Price all allowances so named in the Contract Documents and shall cause the Work so covered to be performed for such sums and by such persons or entities as may be acceptable to Owner and Engineer.

B. Cash Allowances

1. Contractor agrees that:

a. the cash allowances include the cost to Contractor (less any applicable trade discounts) of materials and equipment required by the allowances to be delivered at the Site, and all applicable taxes; and

b. Contractor's costs for unloading and handling on the Site, labor, installation , overhead, profit, and other expenses contemplated for the cash allowances have been included in the Contract Price and not in the allowances, and no demand for additional payment on account of any of the foregoing will be valid.

C. Contingency Allowance

1. Contractor agrees that a contingency allowance, if any, is for the sole use of Owner to cover unanticipated costs.

D. Prior to final payment, an appropriate Change Order will be issued as recommended by Engineer to reflect actual amounts due Contractor on account of Work covered by allowances, and the Contract Price shall be correspondingly adjusted.

11.03 Unit Price Work

A. Where the Contract Documents provide that all or part of the Work is to be Unit Price Work, initially the Contract Price will be deemed to include for all Unit Price Work an amount equal to the sum of the unit price for each separately identified item of Unit Price Work times the estimated quantity of each item as indicated in the Agreement.

B. The estimated quantities of items of Unit Price Work are not guaranteed and are solely for the purpose of comparison of Bids and determining an initial Contract Price. Determinations of the actual quantities and classifications of Unit Price Work performed by Contractor will be made by Engineer subject to the provisions of Paragraph 9.07.

C. Each unit price will be deemed to include an amount considered by Contractor to be adequate to cover Contractor's overhead and profit for each separately identified item.

D. Owner or Contractor may make a Claim for an adjustment in the Contract Price in accordance with Paragraph 10.05 if:

1. the quantity of any item of Unit Price Work performed by Contractor differs materially and significantly from the estimated quantity of such item indicated in the Agreement; and

2. there is no corresponding adjustment with respect any other item of Work; and

3. Contractor believes that Contractor is entitled to an increase in Contract Price as a result of having incurred additional expense or Owner believes that Owner is entitled to a decrease in Contract Price and the parties are unable to agree as to the amount of any such increase or decrease.

PART 12 - CHANGE OF CONTRACT PRICE; CHANGE OF CONTRACT TIMES

12.01 Change of Contract Price

A. The Contract Price may only be changed by a Change Order. Any Claim for an adjustment in the Contract Price shall be based on written notice submitted by the party making the Claim to the Engineer and the other party to the Contract in accordance with the provisions of Paragraph 10.05.

B. The value of any Work covered by a Change Order or of any Claim for an adjustment in the Contract Price will be determined as follows:

1. where the Work involved is covered by unit prices contained in the Contract Documents, by application of such unit prices to the quantities of the items involved (subject to the provisions of Paragraph 11.03); or

2. where the Work involved is not covered by unit prices contained in the Contract Documents, by a mutually agreed lump sum (which may include an allowance for overhead and profit not necessarily in accordance with Paragraph 12.01.C.2); or

3. where the Work involved is not covered by unit prices contained in the Contract Documents and agreement to a lump sum is not reached under Paragraph 12.01.B.2, on the basis of the Cost of the Work (determined as provided in Paragraph 11.01) plus a Contractor's fee for overhead and profit (determined as provided in Paragraph 12.01.C).

C. Contractor's Fee: The Contractor's fee for overhead and profit shall be determined as follows:

1. a mutually acceptable fixed fee; or

2. if a fixed fee is not agreed upon, then a fee based on the following percentages of the various portions of the Cost of the Work:

a. for costs incurred under Paragraphs 11.01.A.1 and 11.01.A.2, the Contractor's fee shall be 15 percent;

b. for costs incurred under Paragraph 11.01.A.3, the Contractor's fee shall be five percent;

c. where one or more tiers of subcontracts are on the basis of Cost of the Work plus a fee and no fixed fee is agreed upon, the intent of Paragraph 12.01.C.2.a is that the Subcontractor who actually performs the Work, at whatever tier, will be paid a fee of 15 percent of the costs incurred by such Subcontractor under Paragraphs 11.01.A.1 and 11.01.A.2 and that any higher tier Subcontractor and Contractor will each be paid a fee of five percent of the amount paid to the next lower tier Subcontractor;

d. no fee shall be payable on the basis of costs itemized under Paragraphs 11.01.A.4, 11.01.A.5, and 11.01.B;

e. the amount of credit to be allowed by Contractor to Owner for any change which results in a net decrease in cost will be the amount of the actual net decrease in cost plus a deduction in Contractor's fee by an amount equal to five percent of such net decrease; and

f. when both additions and credits are involved in any one change, the adjustment in Contractor's fee shall be computed on the basis of the net change in accordance with Paragraphs 12.01.C.2.a through 12.01.C.2.e, inclusive.

12.02 Change of Contract Times

A. The Contract Times may only be changed by a Change Order. Any Claim for an adjustment in the Contract Times shall be based on written notice submitted by the party making the Claim to the Engineer and the other party to the Contract in accordance with the provisions of Paragraph 10.05.

B. Any adjustment of the Contract Times covered by a Change Order or any Claim for an adjustment in the Contract Times will be determined in accordance with the provisions of this Part 12.

12.03 Delays

A. Where Contractor is prevented from completing any part of the Work within the Contract Times due to delay beyond the control of Contractor, the Contract Times will be extended in

an amount equal to the time lost due to such delay if a Claim is made therefor as provided in Paragraph 12.02.A. Delays beyond the control of Contractor shall include, but not be limited to, acts or neglect by Owner, acts or neglect of utility owners or other contractors performing other work as contemplated by Part 7, fires, floods, epidemics, abnormal weather conditions, or acts of God.

B. If Owner, Engineer, or other contractors or utility owners performing other work for Owner as contemplated by Part 7, or anyone for whom Owner is responsible, delays, disrupts, or interferes with the performance or progress of the Work, then Contractor shall be entitled to an equitable adjustment in the Contract Price or the Contract Times , or both. Contractor's entitlement to an adjustment of the Contract Times is conditioned on such adjustment being essential to Contractor's ability to complete the Work within the Contract Times.

C. If Contractor is delayed in the performance or progress of the Work by fire, flood, epidemic, abnormal weather conditions, acts of God, acts or failures to act of utility owners not under the control of Owner, or other causes not the fault of and beyond control of Owner and Contractor, then Contractor shall be entitled to an equitable adjustment in Contract Times, if such adjustment is essential to Contractor's ability to complete the Work within the Contract Times. Such an adjustment shall be Contractor's sole and exclusive remedy for the delays described in this Paragraph 12.03.C.

D. Owner, Engineer and the Related Entities of each of them shall not be liable to Contractor for any claims, costs, losses, or damages (including but not limited to all fees and charges of Engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) sustained by Contractor on or in connection with any other project or anticipated project.

E. Contractor shall not be entitled to an adjustment in Contract Price or Contract Times for delays within the control of Contractor. Delays attributable to and within the control of a Subcontractor or Supplier shall be deemed to be delays within the control of Contractor.

PART 13 - TESTS AND INSPECTIONS; CORRECTION, REMOVAL OR ACCEPTANCE OF DEFECTIVE WORK

13.01 Notice of Defects

A. Prompt notice of all defective Work of which Owner or Engineer has actual knowledge will be given to Contractor. All defective Work may be rejected, corrected, or accepted as provided in this Part 13.

13.02 Access to Work

A. Owner, Engineer, their consultants and other representatives and personnel of Owner, independent testing laboratories, and governmental agencies with jurisdictional interests will have access to the Site and the Work at reasonable times for their observation, inspecting, and testing. Contractor shall provide them proper and safe conditions for such access and advise them of Contractor's Site safety procedures and programs so that they may comply therewith as applicable.

13.03 Tests and Inspections

A. Contractor shall give Engineer timely notice of readiness of the Work for all required inspections, tests, or approvals and shall cooperate with inspection and testing personnel to facilitate required inspections or tests.

B. Owner shall employ and pay for the services of an independent testing laboratory to perform all inspections, tests, or approvals required by the Contract Documents except:

1. for inspections, tests, or approvals covered by Paragraphs 13.03.C and 13.03.D below;

2. that costs incurred in connection with tests or inspections conducted pursuant to Paragraph 13.04.B shall be paid as provided in said Paragraph 13.04.C; and

3. as otherwise specifically provided in the Contract Documents.

C. If Laws or Regulations of any public body having jurisdiction require any Work (or part thereof) specifically to be inspected, tested, or approved by an employee or other representative of such public body, Contractor shall assume full responsibility for arranging and obtaining such inspections, tests, or approvals, pay all costs in connection therewith, and furnish Engineer the required certificates of inspection or approval.

D. Contractor shall be responsible for arranging and obtaining and shall pay all costs in connection with any inspections, tests, or approvals required for Owner's and Engineer's acceptance of materials or equipment to be incorporated in the Work; or acceptance of materials, mix designs, or equipment submitted for approval prior to Contractor's purchase thereof for incorporation in the Work. Such inspections, tests, or approvals shall be performed by organizations acceptable to Owner and Engineer.

E. If any Work (or the work of others) that is to be inspected, tested, or approved is covered by Contractor without written concurrence of Engineer, it must, if requested by Engineer, be uncovered for observation.

F. Uncovering Work as provided in Paragraph 13.03.E shall be at Contractor's expense unless Contractor has given Engineer timely notice of Contractor's intention to cover the same and Engineer has not acted with reasonable promptness in response to such notice.

13.04 Uncovering Work

A. If any Work is covered contrary to the written request of Engineer, it must, if requested by Engineer, be uncovered for Engineer's observation and replaced at Contractor's expense.

B. If Engineer considers it necessary or advisable that covered Work be observed by Engineer or inspected or tested by others, Contractor, at Engineer's request, shall uncover, expose, or otherwise make available for observation, inspection, or testing as Engineer may require, that portion of the Work in question, furnishing all necessary labor, material, and equipment.

C. If it is found that the uncovered Work is defective, Contractor shall pay all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such uncovering, exposure, observation, inspection, and testing, and of satisfactory replacement or reconstruction (including but not limited to all costs of repair or replacement of work of others); and Owner shall be entitled to an appropriate decrease in the Contract Price. If the parties are unable to agree as to the amount thereof, Owner may make a Claim therefor as provided in Paragraph 10.05.

D. If, the uncovered Work is not found to be defective, Contractor shall be allowed an increase in the Contract Price or an extension of the Contract Times, or both, directly attributable to such uncovering, exposure, observation, inspection, testing, replacement, and reconstruction.

If the parties are unable to agree as to the amount or extent thereof, Contractor may make a Claim therefor as provided in Paragraph 10.05.

13.05 Owner May Stop the Work

A. If the Work is defective, or Contractor fails to supply sufficient skilled workers or suitable materials or equipment, or fails to perform the Work in such a way that the completed Work will conform to the Contract Documents, Owner may order Contractor to stop the Work, or any portion thereof, until the cause for such order has been eliminated; however, this right of Owner to stop the Work shall not give rise to any duty on the part of Owner to exercise this right for the benefit of Contractor, any Subcontractor, any Supplier, any other individual or entity, or any surety for, or employee or agent of any of them.

13.06 Correction or Removal of Defective Work

A. Promptly after receipt of notice, Contractor shall correct all defective Work, whether or not fabricated, installed, or completed, or, if the Work has been rejected by Engineer, remove it from the Project and replace it with Work that is not defective. Contractor shall pay all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such correction or removal (including but not limited to all costs of repair or replacement of work of others).

B. When correcting defective Work under the terms of this Paragraph 13.06 or Paragraph 13.07, Contractor shall take no action that would void or otherwise impair Owner's special warranty and guarantee, if any, on said Work.

13.07 Correction Period

A. If within one year after the date of Substantial Completion (or such longer period of time as may be prescribed by the terms of any applicable special guarantee required by the Contract Documents) or by any specific provision of the Contract Documents, any Work is found to be defective, or if the repair of any damages to the land or areas made available for Contractor's use by Owner or permitted by Laws and Regulations as contemplated in Paragraph 6.11.A is found to be defective, Contractor shall promptly, without cost to Owner and in accordance with Owner's written instructions:

1. repair such defective land or areas; or

2. correct such defective Work; or

3. if the defective Work has been rejected by Owner, remove it from the Project and replace it with Work that is not defective, and

4. satisfactorily correct or repair or remove and replace any damage to other Work, to the work of others or other land or areas resulting therefrom.

B. If Contractor does not promptly comply with the terms of Owner's written instructions, or in an emergency where delay would cause serious risk of loss or damage, Owner may have the defective Work corrected or repaired or may have the rejected Work removed and replaced. All claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such correction or repair or such removal

and replacement (including but not limited to all costs of repair or replacement of work of others) will be paid by Contractor.

C. In special circumstances where a particular item of equipment is placed in continuous service before Substantial Completion of all the Work, the correction period for that item may start to run from an earlier date if so provided in the Specifications.

D. Where defective Work (and damage to other Work resulting therefrom) has been corrected or removed and replaced under this Paragraph 13.07, the correction period hereunder with respect to such Work will be extended for an additional period of one year after such correction or removal and replacement has been satisfactorily completed.

E. Contractor's obligations under this Paragraph 13.07 are in addition to any other obligation or warranty. The provisions of this Paragraph 13.07 shall not be construed as a substitute for or a waiver of the provisions of any applicable statute of limitation or repose.

13.08 Acceptance of Defective Work

A. If, instead of requiring correction or removal and replacement of defective Work, Owner (and, prior to Engineer's recommendation of final payment, Engineer) prefers to accept it, Owner may do so. Contractor shall pay all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) attributable to Owner's evaluation of and determination to accept such defective Work (such costs to be approved by Engineer as to reasonableness) and the diminished value of the Work to the extent not otherwise paid by Contractor pursuant to this sentence. If any such acceptance occurs prior to Engineer's recommendation of final payment, a Change Order will be issued incorporating the necessary revisions in the Contract Documents with respect to the Work, and Owner shall be entitled to an appropriate decrease in the Contract Price, reflecting the diminished value of Work so accepted. If the parties are unable to agree as to the amount thereof, Owner may make a Claim therefor as provided in Paragraph 10.05. If the acceptance occurs after such recommendation, an appropriate amount will be paid by Contractor to Owner.

13.09 Owner May Correct Defective Work

A. If Contractor fails within a reasonable time after written notice from Engineer to correct defective Work or to remove and replace rejected Work as required by Engineer in accordance with Paragraph 13.06.A, or if Contractor fails to perform the Work in accordance with the Contract Documents, or if Contractor fails to comply with any other provision of the Contract Documents, Owner may, after seven (7) days written notice to Contractor, correct or remedy any such deficiency.

B. In exercising the rights and remedies under this Paragraph 13.09, Owner shall proceed expeditiously. In connection with such corrective or remedial action, Owner may exclude Contractor from all or part of the Site, take possession of all or part of the Work and suspend Contractor's services related thereto, take possession of Contractor's tools, appliances, construction equipment and machinery at the Site, and incorporate in the Work all materials and equipment stored at the Site or for which Owner has paid Contractor but which are stored elsewhere. Contractor shall allow Owner, Owner's representatives, agents and employees, Owner's other contractors, and Engineer and Engineer's consultants access to the Site to enable Owner to exercise the rights and remedies under this Paragraph.

C. All claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) incurred or sustained by Owner in exercising the rights and

remedies under this Paragraph 13.09 will be charged against Contractor, and a Change Order will be issued incorporating the necessary revisions in the Contract Documents with respect to the Work; and Owner shall be entitled to an appropriate decrease in the Contract Price. If the parties are unable to agree as to the amount of the adjustment, Owner may make a Claim therefor as provided in Paragraph 10.05. Such claims, costs, losses and damages will include but not be limited to all costs of repair, or replacement of work of others destroyed or damaged by correction, removal, or replacement of Contractor's defective Work.

D. Contractor shall not be allowed an extension of the Contract Times because of any delay in the performance of the Work attributable to the exercise by Owner of Owner's rights and remedies under this Paragraph 13.09.

PART 14 - PAYMENTS TO CONTRACTOR AND COMPLETION

14.01 Schedule of Values

A. The Schedule of Values established as provided in Paragraph 2.07.A will serve as the basis for progress payments and will be incorporated into a form of Application for Payment acceptable to Engineer. Progress payments on account of Unit Price Work will be based on the number of units completed.

14.02 Progress Payments

A. Applications for Payments

1. At least 20 days before the date established in the Agreement for each progress payment (but not more often than once a month), Contractor shall submit to Engineer for review an Application for Payment filled out and signed by Contractor covering the Work completed as of the date of the Application and accompanied by such supporting documentation as is required by the Contract Documents. If payment is requested on the basis of materials and equipment not incorporated in the Work but delivered and suitably stored at the Site or at another location agreed to in writing, the Application for Payment shall also be accompanied by a bill of sale, invoice, or other documentation warranting that Owner has received the materials and equipment free and clear of all Liens and evidence that the materials and equipment are covered by appropriate property insurance or other arrangements to protect Owner's interest therein, all of which must be satisfactory to Owner.

2. Beginning with the second Application for Payment, each Application shall include an affidavit of Contractor stating that all previous progress payments received on account of the Work have been applied on account to discharge Contractor's legitimate obligations associated with prior Applications for Payment.

3. The amount of retainage with respect to progress payments will be as stipulated in the Agreement.

B. Review of Applications

1. Engineer will, within fifteen (15) days after receipt of each Application for Payment, either indicate in writing a recommendation of payment and present the Application to Owner or return the Application to Contractor indicating in writing Engineer's reasons for refusing to recommend payment. In the latter case, Contractor may make the necessary corrections and resubmit the Application.

2. Engineer's recommendation of any payment requested in an Application for Payment will constitute a representation by Engineer to Owner, based on Engineer's observations on the Site of the executed Work as an experienced and qualified design professional and on Engineer's review of the Application for Payment and the accompanying data and schedules, that to the best of Engineer's knowledge, information and belief:

    a. the Work has progressed to the point indicated;

    b. the quality of the Work is generally in accordance with the Contract Documents (subject to an evaluation of the Work as a functioning whole prior to or upon Substantial Completion, to the results of any subsequent tests called for in the Contract Documents, to a final determination of quantities and classifications for Unit Price Work under Paragraph 9.07, and to any other qualifications stated in the recommendation); and

    c. the conditions precedent to Contractor's being entitled to such payment appear to have been fulfilled in so far as it is Engineer's responsibility to observe the Work.

3. By recommending any such payment Engineer will not thereby be deemed to have represented that:

    a. inspections made to check the quality or the quantity of the Work as it has been performed have been exhaustive, extended to every aspect of the Work in progress, or involved detailed inspections of the Work beyond the responsibilities specifically assigned to Engineer in the Contract Documents; or

    b. that there may not be other matters or issues between the parties that might entitle Contractor to be paid additionally by Owner or entitle Owner to withhold payment to Contractor.

4. Neither Engineer's review of Contractor's Work for the purposes of recommending payments nor Engineer's recommendation of any payment, including final payment, will impose responsibility on Engineer:

    a. to supervise, direct, or control the Work, or

    b. for the means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or

    c. for Contractor's failure to comply with Laws and Regulations applicable to Contractor's performance of the Work, or

    d. to make any examination to ascertain how or for what purposes Contractor has used the moneys paid on account of the Contract Price, or

    e. to determine that title to any of the Work, materials, or equipment has passed to Owner free and clear of any Liens.

5. Engineer may refuse to recommend the whole or any part of any payment if, in Engineer's opinion, it would be incorrect to make the representations to Owner stated in Paragraph 14.02.B.2. Engineer may also refuse to recommend any such payment or, because of subsequently discovered evidence or the results of subsequent inspections or tests, revise or revoke any such payment recommendation previously made, to such extent as may be necessary in Engineer's opinion to protect Owner from loss because:

a. the Work is defective, or completed Work has been damaged, requiring correction or replacement;

b. the Contract Price has been reduced by Change Orders;

c. Owner has been required to correct defective Work or complete Work in accordance with Paragraph 13.09; or

d. Engineer has actual knowledge of the occurrence of any of the events enumerated in Paragraph 15.02.A.

C. Payment Becomes Due

1. Fifteen (15) days after presentation of the Application for Payment to Owner with Engineer's recommendation, the amount recommended will (subject to the provisions of Paragraph 14.02.D) become due, and when due will be paid by Owner to Contractor.

D. Reduction in Payment

1. Owner may refuse to make payment of the full amount recommended by Engineer because:

a. claims have been made against Owner on account of Contractor's performance or furnishing of the Work;

b. Liens have been filed in connection with the Work, except where Contractor has delivered a specific bond satisfactory to Owner to secure the satisfaction and discharge of such Liens;

c. there are other items entitling Owner to a set-off against the amount recommended; or

d. Owner has actual knowledge of the occurrence of any of the events enumerated in Paragraphs 14.02.B.5.a through 14.02.B.5.c or Paragraph 15.02.A.

2. If Owner refuses to make payment of the full amount recommended by Engineer, Owner will give Contractor immediate written notice (with a copy to Engineer) stating the reasons for such action and promptly pay Contractor any amount remaining after deduction of the amount so withheld. Owner shall promptly pay Contractor the amount so withheld, or any adjustment thereto agreed to by Owner and Contractor, when Contractor corrects to Owner's satisfaction the reasons for such action.

3. If it is subsequently determined that Owner's refusal of payment was not justified, the amount wrongfully withheld shall be treated as an amount due as determined by Paragraph 14.02.C.1.

14.03 Contractor's Warranty of Title

A. Contractor warrants and guarantees that title to all Work, materials, and equipment covered by any Application for Payment, whether incorporated in the Project or not, will pass to Owner no later than the time of payment free and clear of all Liens.

14.04 Substantial Completion

A. When Contractor considers the entire Work ready for its intended use Contractor shall notify Owner and Engineer in writing that the entire Work is substantially complete (except for items

specifically listed by Contractor as incomplete) and request that Engineer issue a certificate of Substantial Completion.

B. Promptly after Contractor's notification, Owner, Contractor, and Engineer shall make an inspection of the Work to determine the status of completion. If Engineer does not consider the Work substantially complete, Engineer will notify Contractor in writing giving the reasons therefor.

C. If Engineer considers the Work substantially complete, Engineer will deliver to Owner a tentative certificate of Substantial Completion which shall fix the date of Substantial Completion. There shall be attached to the certificate a tentative list of items to be completed or corrected before final payment. Owner shall have seven (7) days after receipt of the tentative certificate during which to make written objection to Engineer as to any provisions of the certificate or attached list. If, after considering such objections, Engineer concludes that the Work is not substantially complete, Engineer will within 14 days after submission of the tentative certificate to Owner notify Contractor in writing, stating the reasons therefor. If, after consideration of Owner's objections, Engineer considers the Work substantially complete, Engineer will within said 14 days execute and deliver to Owner and Contractor a definitive certificate of Substantial Completion (with a revised tentative list of items to be completed or corrected) reflecting such changes from the tentative certificate as Engineer believes justified after consideration of any objections from Owner.

D. At the time of delivery of the tentative certificate of Substantial Completion, Engineer will deliver to Owner and Contractor a written recommendation as to division of responsibilities pending final payment between Owner and Contractor with respect to security, operation, safety, and protection of the Work, maintenance, heat, utilities, insurance, and warranties and guarantees. Unless Owner and Contractor agree otherwise in writing and so inform Engineer in writing prior to Engineer's issuing the definitive certificate of Substantial Completion, Engineer's aforesaid recommendation will be binding on Owner and Contractor until final payment.

E. Owner shall have the right to exclude Contractor from the Site after the date of Substantial Completion subject to allowing Contractor reasonable access to complete or correct items on the tentative list.

14.05 Partial Utilization

A. Prior to Substantial Completion of all the Work, Owner may use or occupy any substantially completed part of the Work which has specifically been identified in the Contract Documents, or which Owner, Engineer, and Contractor agree constitutes a separately functioning and usable part of the Work that can be used by Owner for its intended purpose without significant interference with Contractor's performance of the remainder of the Work, subject to the following conditions.

1. Owner at any time may request Contractor in writing to permit Owner to use or occupy any such part of the Work which Owner believes to be ready for its intended use and substantially complete. If and when Contractor agrees that such part of the Work is substantially complete, Contractor will certify to Owner and Engineer that such part of the Work is substantially complete and request Engineer to issue a certificate of Substantial Completion for that part of the Work.

2. Contractor at any time may notify Owner and Engineer in writing that Contractor considers any such part of the Work ready for its intended use and substantially complete and request Engineer to issue a certificate of Substantial Completion for that part of the Work.

3. Within a reasonable time after either such request, Owner, Contractor, and Engineer shall make an inspection of that part of the Work to determine its status of completion. If Engineer does not consider that part of the Work to be substantially complete, Engineer will notify Owner and Contractor in writing giving the reasons therefor. If Engineer considers that part of the Work to be substantially complete, the provisions of Paragraph 14.04 will apply with respect to certification of Substantial Completion of that part of the Work and the division of responsibility in respect thereof and access thereto.

4. No use or occupancy or separate operation of part of the Work may occur prior to compliance with the requirements of Paragraph 5.10 regarding property insurance.

14.06 Final Inspection

A. Upon written notice from Contractor that the entire Work or an agreed portion thereof is complete, Engineer will promptly make a final inspection with Owner and Contractor and will notify Contractor in writing of all particulars in which this inspection reveals that the Work is incomplete or defective. Contractor shall immediately take such measures as are necessary to complete such Work or remedy such deficiencies.

14.07 Final Payment

A. Application for Payment

1. After Contractor has, in the opinion of Engineer, satisfactorily completed all corrections identified during the final inspection and has delivered, in accordance with the Contract Documents, all maintenance and operating instructions, schedules, guarantees, bonds, certificates or other evidence of insurance certificates of inspection, marked-up record documents (as provided in Paragraph 6.12), and other documents, Contractor may make application for final payment following the procedure for progress payments.

2. The final Application for Payment shall be accompanied (except as previously delivered) by:

   a. all documentation called for in the Contract Documents, including but not limited to the evidence of insurance required by Paragraph 5.04.B.7;

   b. consent of the surety, if any, to final payment;

   c. a list of all Claims against Owner that Contractor believes are unsettled; and

   d. complete and legally effective releases or waivers (satisfactory to Owner) of all Lien rights arising out of or Liens filed in connection with the Work.

3. In lieu of the releases or waivers of Liens specified in Paragraph 14.07.A.2 and as approved by Owner, Contractor may furnish receipts or releases in full and an affidavit of Contractor that: (i) the releases and receipts include all labor, services, material, and equipment for which a Lien could be filed; and (ii) all payrolls, material and equipment bills, and other indebtedness connected with the Work for which Owner or Owner's property might in any way be responsible have been paid or otherwise satisfied. If any Subcontractor or Supplier fails to furnish such a release or receipt in full, Contractor may

furnish a bond or other collateral satisfactory to Owner to indemnify Owner against any Lien.

B. Engineer's Review of Application and Acceptance

1. If, on the basis of Engineer's observation of the Work during construction and final inspection, and Engineer's review of the final Application for Payment and accompanying documentation as required by the Contract Documents, Engineer is satisfied that the Work has been completed and Contractor's other obligations under the Contract Documents have been fulfilled, Engineer will, within ten (10) days after receipt of the final Application for Payment, indicate in writing Engineer's recommendation of payment and present the Application for Payment to Owner for payment. At the same time Engineer will also give written notice to Owner and Contractor that the Work is acceptable subject to the provisions of Paragraph 14.09. Otherwise, Engineer will return the Application for Payment to Contractor, indicating in writing the reasons for refusing to recommend final payment, in which case Contractor shall make the necessary corrections and resubmit the Application for Payment.

C. Payment Becomes Due

1. Thirty (30) days after the presentation to Owner of the Application for Payment and accompanying documentation, the amount recommended by Engineer, less any sum Owner is entitled to set off against Engineer's recommendation, including but not limited to liquidated damages, will become due and , will be paid by Owner to Contractor.

14.08 Final Completion Delayed

A. If, through no fault of Contractor, final completion of the Work is significantly delayed, and if Engineer so confirms, Owner shall, upon receipt of Contractor's final Application for Payment (for Work fully completed and accepted) and recommendation of Engineer, and without terminating the Contract, make payment of the balance due for that portion of the Work fully completed and accepted. If the remaining balance to be held by Owner for Work not fully completed or corrected is less than the retainage stipulated in the Agreement, and if bonds have been furnished as required in Paragraph 5.01, the written consent of the surety to the payment of the balance due for that portion of the Work fully completed and accepted shall be submitted by Contractor to Engineer with the Application for such payment. Such payment shall be made under the terms and conditions governing final payment, except that it shall not constitute a waiver of Claims.

14.09 Waiver of Claims

A. The making and acceptance of final payment will constitute:

1. a waiver of all Claims by Owner against Contractor, except Claims arising from unsettled Liens, from defective Work appearing after final inspection pursuant to Paragraph 14.06, from failure to comply with the Contract Documents or the terms of any special guarantees specified therein, or from Contractor's continuing obligations under the Contract Documents; and

2. a waiver of all Claims by Contractor against Owner other than those previously made in accordance with the requirements herein and expressly acknowledged by Owner in writing as still unsettled.

PART 15 - SUSPENSION OF WORK AND TERMINATION

15.01 Owner May Suspend Work

A. At any time and without cause, Owner may suspend the Work or any portion thereof for a period of not more than 90 consecutive days by notice in writing to Contractor and Engineer which will fix the date on which Work will be resumed. Contractor shall resume the Work on the date so fixed. Contractor shall be granted an adjustment in the Contract Price or an extension of the Contract Times, or both, directly attributable to any such suspension if Contractor makes a Claim therefor as provided in Paragraph 10.05.

15.02 Owner May Terminate for Cause

A. The occurrence of any one or more of the following events will justify termination for cause:

1. Contractor's persistent failure to perform the Work in accordance with the Contract Documents (including, but not limited to, failure to supply sufficient skilled workers or suitable materials or equipment or failure to adhere to the Progress Schedule established under Paragraph 2.07 as adjusted from time to time pursuant to Paragraph 6.04);

2. Contractor's disregard of Laws or Regulations of any public body having jurisdiction;

3. Contractor's disregard of the authority of Engineer; or

4. Contractor's violation in any substantial way of any provisions of the Contract Documents.

B. If one or more of the events identified in Paragraph 15.02.A occur, Owner may, after giving Contractor (and surety) seven (7) days written notice of its intent to terminate the services of Contractor:

1. exclude Contractor from the Site, and take possession of the Work and of all Contractor's tools, appliances, construction equipment, and machinery at the Site, and use the same to the full extent they could be used by Contractor (without liability to Contractor for trespass or conversion),

2. incorporate in the Work all materials and equipment stored at the Site or for which Owner has paid Contractor but which are stored elsewhere, and

3. complete the Work as Owner may deem expedient.

C. If Owner proceeds as provided in Paragraph 15.02.B, Contractor shall not be entitled to receive any further payment until the Work is completed. If the unpaid balance of the Contract Price exceeds all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) sustained by Owner arising out of or relating to completing the Work, such excess will be paid to Contractor. If such claims, costs, losses, and damages exceed such unpaid balance, Contractor shall pay the difference to Owner. Such claims, costs, losses, and damages incurred by Owner will be reviewed by Engineer as to their reasonableness and, when so approved by Engineer, incorporated in a Change Order. When exercising any rights or remedies under this Paragraph Owner shall not be required to obtain the lowest price for the Work performed.

D. Notwithstanding Paragraphs 15.02.B and 15.02.C, Contractor's services will not be terminated if Contractor begins within seven (7) days of receipt of notice of intent to terminate

to correct its failure to perform and proceeds diligently to cure such failure within no more than 30 days of receipt of said notice.

E. Where Contractor's services have been so terminated by Owner, the termination will not affect any rights or remedies of Owner against Contractor then existing or which may thereafter accrue. Any retention or payment of moneys due Contractor by Owner will not release Contractor from liability.

F. If and to the extent that Contractor has provided a performance bond under the provisions of Paragraph 5.01.A, the termination procedures of that bond shall supersede the provisions of Paragraphs 15.02.B, and 15.02.C.

15.03 Owner May Terminate For Convenience

A. Upon seven (7) days written notice to Contractor and Engineer, Owner may, without cause and without prejudice to any other right or remedy of Owner, terminate the Contract. In such case, Contractor shall be paid for (without duplication of any items):

1. completed and acceptable Work executed in accordance with the Contract Documents prior to the effective date of termination, including fair and reasonable sums for overhead and profit on such Work;

2. expenses sustained prior to the effective date of termination in performing services and furnishing labor, materials, or equipment as required by the Contract Documents in connection with uncompleted Work, plus fair and reasonable sums for overhead and profit on such expenses;

3. all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) incurred in settlement of terminated contracts with Subcontractors, Suppliers, and others; and

4. reasonable expenses directly attributable to termination.

B. Contractor shall not be paid on account of loss of anticipated profits or revenue or other economic loss arising out of or resulting from such termination.

15.04 Contractor May Stop Work or Terminate

A. If, through no act or fault of Contractor, (i) the Work is suspended for more than 90 consecutive days by Owner or under an order of court or other public authority, or (ii) Engineer fails to act on any Application for Payment within 30 days after it is submitted, or (iii) Owner fails for 30 days to pay Contractor any sum finally determined to be due, then Contractor may, upon seven (7) days written notice to Owner and Engineer, and provided Owner or Engineer do not remedy such suspension or failure within that time, terminate the Contract and recover from Owner payment on the same terms as provided in Paragraph 15.03.

B. In lieu of terminating the Contract and without prejudice to any other right or remedy, if Engineer has failed to act on an Application for Payment within 30 days after it is submitted, or Owner has failed for 30 days to pay Contractor any sum finally determined to be due, Contractor may, seven (7) days after written notice to Owner and Engineer, stop the Work until payment is made of all such amounts due Contractor, including interest thereon. The

provisions of this Paragraph 15.04 are not intended to preclude Contractor from making a Claim under Paragraph 10.05 for an adjustment in Contract Price or Contract Times or otherwise for expenses or damage directly attributable to Contractor's stopping the Work as permitted by this Paragraph.

PART 16 - DISPUTE RESOLUTION

16.01 Methods and Procedures

A. Either Owner or Contractor may request mediation of any Claim submitted to Engineer for a decision under Paragraph 10.05 before such decision becomes final and binding. The mediation will be governed by the Construction Industry Mediation Rules of the American Arbitration Association in effect as of the Effective Date of the Agreement. The request for mediation shall be submitted in writing to the American Arbitration Association and the other party to the Contract. Timely submission of the request shall stay the effect of Paragraph 10.05.E.

B. Owner and Contractor shall participate in the mediation process in good faith. The process shall be concluded within 60 days of filing of the request. The date of termination of the mediation shall be determined by application of the mediation rules referenced above.

C. If the Claim is not resolved by mediation, Engineer's action under Paragraph 10.05.C or a denial pursuant to Paragraphs 10.05.C.3 or 10.05.D shall become final and binding 30 days after termination of the mediation unless, within that time period, Owner or Contractor:

1. elects in writing to invoke any dispute resolution process, or

2. agrees with the other party to submit the Claim to another dispute resolution process, or

3. gives written notice to the other party of their intent to submit the Claim to a court of competent jurisdiction.

PART 17 - MISCELLANEOUS

17.01 Giving Notice

A. Whenever any provision of the Contract Documents requires the giving of written notice, it will be deemed to have been validly given if:

1. delivered in person to the individual or to a member of the firm or to an officer of the corporation for whom it is intended, or

2. delivered at or sent by registered or certified mail, postage prepaid, to the last business address known to the giver of the notice.

17.02 Computation of Times

A. When any period of time is referred to in the Contract Documents by days, it will be computed to exclude the first and include the last day of such period. If the last day of any such period falls on a Saturday or Sunday or on a day made a legal holiday by the law of the applicable jurisdiction, such day will be omitted from the computation.

17.03 Cumulative Remedies

A. The duties and obligations imposed by these General Conditions and the rights and remedies available hereunder to the parties hereto are in addition to, and are not to be construed in any way as a limitation of, any rights and remedies available to any or all of them which are otherwise imposed or available by Laws or Regulations, by special warranty or guarantee, or by other provisions of the Contract Documents. The provisions of this Paragraph will be as effective as if repeated specifically in the Contract Documents in connection with each particular duty, obligation, right, and remedy to which they apply.

17.04 Survival of Obligations

A. All representations, indemnifications, warranties, and guarantees made in, required by, or given in accordance with the Contract Documents, as well as all continuing obligations indicated in the Contract Documents, will survive final payment, completion, and acceptance of the Work or termination or completion of the Contract or termination of the services of Contractor.

17.05 Controlling Law

A. This Contract is to be governed by the law of the state in which the Project is located.

17.06 Headings

A. Part and paragraph headings are inserted for convenience only and do not constitute parts of these General Conditions.

INSTRUCTIONS TO BIDDERS

1. Only one copy of bid is required unless otherwise specified.

2. Bids, amendments thereto or withdrawal request must be received by the time advertised for bid openings to be timely filed. It is the vendor's sole responsibility to insure that these documents are received by the purchasing office at the time indicated in the bid document.

   PLEASE NOTE: THE VENDOR IS ULTIMATELY RESPONSIBLE FOR VERIFYING THEY HAVE RECEIVED ANY/ALL ADDENDA PROR TO THE BID OPENING.

3. When specifications or descriptive papers are submitted with the bid, enter bidder's name thereon.

4. Submit your signed bid on the bidder's schedule provided. Show bid number on envelope as instructed and the bid name or description. Newberry County accepts no responsibility for unmarked or improperly marked envelopes.

5. Bidders must clearly mark as "Confidential" each part of their bid which they consider to be proprietary information that could be exempt from disclosure under Section 30-4-40 Code of Laws of South Carolina, 1976, as amended, (also known as the Freedom of Information Act). The County reserves the right to determine whether this information should be exempt from disclosure and no legal action may be brought against the County or its agents for its determination in this regard.

6. By submission of a bid, you are guaranteeing that all goods and services meet the requirements of the solicitation during the contract period.

7. Tie bids will be resolved in accordance with the provisions of the Newberry County Purchasing Ordinance.

GENERAL PROVISIONS

1. The County of Newberry reserves the right to reject any and all bids, to cancel a solicitation, and to waive any technicality if deemed to be in the best interest of the County.

2. Unit prices will govern over extended prices unless otherwise stated in this bid invitation.

3. **PROHIBITION OF GRATUITIES:** South Carolina law and the Newberry County Purchasing Ordinance prohibit the giving of anything of value in return for favors or other preferential treatment in the purchasing process. Bidders should govern themselves accordingly.

4. **BIDDERS QUALIFICATION:** Bidders must, upon request of the county, furnish satisfactory evidence of their ability to furnish products or services in accordance with the terms and conditions of these specifications. The County reserves the right to make the final determination as to the bidder's ability to provide the products or services requested herein. Bidder determined to be irresponsible bidders are not allowed to bid to provide the County goods or services.

5. **BIDDERS RESPONSIBILITY:** Each bidder shall fully acquaint himself with conditions relating to the scope and restrictions attending the execution of the work under the conditions of this bid. It is expected that this will sometimes require on-site observation. The failure or omission of a bidder to acquaint himself with existing conditions shall in no way relieve him of any obligation with respect to this bid or to the contract.

6. **AWARD CRITERIA:** The contract shall be awarded to the lowest responsible and responsive bidder(s) whose bid meets the requirements and criteria set forth in the Invitation for Bid. Award may be made to one or a multiple of bidders, whichever deems to be in the best interest of the County, or unless otherwise stated on the bidder's schedule.

7. **WAIVER:** The County reserves the right to waive any Instruction to Bidders, General or Special Provisions, General or Special Conditions, or specifications deviation if deemed to be in the best interest of the county.

8. **COMPETITION:** This solicitation is intended to promote competition. If any language, specifications, terms and conditions, or any combination thereof restricts or limits the requirements in this solicitation to a single source, it shall be the responsibility of the interested vendor to notify the Purchasing Director on in writing within five (5) days prior to the opening date. The solicitation may or may not be changed but a review of such notification will be made prior to the award.

9. **REJECTION:** Ambiguous bids which are uncertain as to terms, delivery, quantity, or compliance with specifications may be rejected or otherwise disregarded if such action is in the best interest of the County.

GENERAL CONDITIONS

1. **DEFAULT:** In case of default by the contractor, the County reserves the right to purchase any or all items in default in the open market, charging the contractor with any excessive costs. Should such charge be assessed, no subsequent bids of the defaulting contractor will be considered until the assessed charge has been satisfied.

2. **NON-APPROPRIATION:** Any contract entered into by the County resulting from this bid invitation shall be subject to cancellation without damages or further obligation when funds are not appropriated or otherwise made available to support continuation of performance in a subsequent fiscal period or appropriated year.

3. **HOLD HARMLESS AND INSURANCE**: The successful bidder shall indemnify and hold harmless the County of Newberry and all County officers, agents and employees against all suits or claims for personal injury or property damage resulting from, or arising from, the successful bidder's performance of the contract, as well as against any suits or claims of any character brought against the County or its agents or employees by reason of any claim of infringement of any patent, trade mark, trade dress, or copyright, including reimbursement to the County for all attorneys fees and court costs incurred by the County in defending itself or its agents or employees against any such claim or suit. In addition, the successful bidder will maintain a public liability policy with minimum limits of $1,000,000 per occurrence, or $1,000,000 single limit, for damages arising from acts which occur during the contract period, with the County of Newberry named as an additional insured; the successful bidder shall also maintain worker's compensation and vehicle liability insurance in the amounts required by statutory law. Proof of such coverage will be provided upon demand or as otherwise provided in the bid specifications.

4. **CONTRACT ADMINISTRATION:** Questions or problems arising after award of this contract shall be directed to the Purchasing Director, P.O. Box 156, Newberry, SC 29108, calling 803-321-2100 or via email at cwaldrop@newberrycounty.net.

5. **FORCE MAJEURE:** The Contractor shall not be liable for any excess costs if the failure to perform the contract arises out of causes beyond the control and without fault or negligence of the contractor. Such causes may include, but are not restricted to acts of God or of a public enemy, acts of Government in either its sovereign or contractual capacity, fires, floods, epidemics, quarantine restrictions, strikes, freight embargoes, and unusually severe weather; but in every case the failure to perform must be beyond the control and without the fault or negligence of the contractor. If the failure to perform is caused by default of a subcontractor, and if such default arises out of causes beyond the control of both

the contractor and subcontractor and without excess costs for failure to perform, unless the supplies or services to be furnished by the subcontractor were obtainable from other sources in sufficient time to permit the contractor to meet the required delivery schedule.

6. **PUBLIC RELEASE:** Contractor agrees not to refer to award of this contract in commercial advertising in such a manner as to state or imply that the products or services provided are endorsed or preferred by the User.

7. **QUALITY OF PRODUCT:** Unless otherwise indicated in this bid it is understood and agreed that any items offered or shipped on this bid shall be new, in first class condition, and without defect that all containers shall be new and suitable for storage or shipment, and that prices include standard commercial packaging and shipping to the specified destination in Newberry County. No demonstration models shall be sold as new, without prior written permission of the County.

8. **S.C. LAW CLAUSE:** Upon award of a contract under this bid, the person, partnership, association or corporation to whom the award is made must comply with the laws of South Carolina which require such person or entity to be authorized and/or licensed to do business with this State. Notwithstanding the fact that applicable statutes may exempt or exclude the successful bidder from requirements that it be authorized and/or licensed to do business in this State, by submission of this signed bid, the bidder agrees to subject himself to the jurisdiction and process of the courts of the State of South Carolina as to all matters and disputes arising or to arise under the contract and the performance thereof, including any questions as to the liability for taxes, licenses, or fees levied by the State.

9. **ASSIGNMENT:** No contract or its Provisions may be assigned, sublet, or transferred without the written consent of the Purchasing Director.

10. **AFFIRMATIVE ACTION:** The successful bidder will take affirmative action in complying with all Federal and State requirements concerning fair employment of the handicapped, and concerning the treatment of all employees, without regard or discrimination by reason of race, color, religion, sex, national origin or physical handicap.

11. **DELIVERIES:** All deliveries shall be FOB Destination. It is agreed by the parties hereto that delivery by the contractor to the common carrier does not

constitute delivery to the County. Any claim for loss or damage shall be between the contractor and the carrier.

12. **APPROPRIATE S.C. SALES TAX** shall be included as a line item in the bid unless other wise noted in the request from the County. The rate for Newberry County is 7%.

13. **PAYMENT TERMS:** Payment can be made using the AIA pay application. Payment will be made within thirty (30) days of acceptance of the completed order. Payment will be made earlier providing there is an early payment discount offered.

14. **BID BOND**: For each bid in excess of $25,000.00 each bidder will submit with their bid a bond in the amount of 5% of the total price of the bid submitted. The bid bonds will be returned to the unsuccessful bidders once the county accepts the lowest most responsive bid. If the most responsive bidder fails to perform the responsibility of the bid within 20 days of the award, then the bid bond will be forfeited to the county as liquidated damages and the next lowest bidder will be awarded the bid. Bid bonds may be in the form of a surety, a cashier's check or an irrevocable letter of credit in favor of Newberry County, issued by a commercial bank in South Carolina.

15. **PERFORMANCE AND PAYMENT BONDS:** The chosen vendor will be required to submit to the County both a performance bond and payment bond in the amount of 100% of the contract price before commencing with the work. **Both bonds will be issued from a surety company with an "A" minimum rating of performance as stated in the most current publication of Best Key Rating Guide, Property Liability.**

16. **Compliance with The South Carolina Illegal Immigration Act**: By submitting an offer, Bidder certifies that it will comply with the applicable requirements of Title 8, Chapter 14 of the South Carolina code of Laws (originally enacted as Section 3 of The South Carolina Illegal Immigration act, 2008 S.C. Act No. 280) and agrees to provide upon request any documentation required to establish either: (a) the applicability of Title 8, Chapter 14 to Bidder and any subcontractor or sub-subcontractors; or (b) the compliance with Title 8, Chapter 14 by Bidder and any subcontractors or sub-subcontractors. Pursuant to Section 8-14-60, "A person who knowingly makes or files any false, fictitious, or fraudulent document, statement, or report pursuant to this chapter is guilty of a felony and, upon conviction, must be fined within the discretion of the court or imprisoned for not more than five years, or both". Bidder agrees to include in any contracts with its subcontractors language requiring the subcontractors to (a) comply with the applicable requirements of Title 8, Chapter 14, and (b) include in any contracts with the sub-subcontractors language requiring the sub-subcontract to comply with the applicable requirements of Title 8, Chapter 14.

SECTION 01 06 00

REGULATORY REQUIREMENTS

PART 1 GENERAL

1.01 DESCRIPTION

A. The following requirements of Regulatory Agencies having jurisdiction within this project area are considered a part of these Contract Documents.

B. The project construction, including the letting of contracts, shall conform to any applicable requirements of the State, territorial and local laws and/or ordinances provided that these requirements do not conflict with any Federal laws and this sub-chapter.

C. South Carolina Sales Tax: All applicable South Carolina sales tax shall be paid by the Contractor.

a. Use of chemicals: All chemicals used during the project construction or furnished for project operation, whether herbicide, pesticide, disinfectant, polymer, reactant or of other classification, must show approval of EPA or USDA. Use of all such chemicals and disposal of residues shall be in strict conformance with manufacturer's instructions.

D. Safety and Health Regulations: The Contractor shall comply with the Department of Labor Safety and Health Regulations for construction promulgated under the Occupational Safety and Health Act of 1970 (PL 91-596) and under Section 107 of the Contract Work Hours and Safety Standards Act (PL 91-54).

1.02 INSPECTION BY AGENCIES:

A. The representatives of the South Carolina Department of Health and Environmental Control, Newberry County, Environmental Protection Agency, and if required, the U.S. Army Corps of Engineers shall have access to the work wherever it is, in preparation or in progress, and the Contractor shall provide proper facilities for such access and inspection.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 01 23 00

BID ALTERNATES AND SUBSTITUTES

PART 1 GENERAL

1.01 SUMMARY

A. This Section includes administrative and procedural requirements for alternates.

1.02 DEFINITIONS

A. Bid Alternate: A scope of work proposed by the Bidders and stated on the Bid Form for certain work defined in the Bidding Requirements that may be added to or deducted from the Base Bid amount if Owner decides to accept corresponding changes either in the amount of construction to be completed, or in the products, materials, equipment, systems or installation methods described in the Contract Documents. The selection of the successful bidder will be based on the Base Bid amount which does not include Alternate Bid Items.

1. The cost or credit for each alternate is the net addition or deduction from the Contract Sum to incorporate alternates into the Work. No other adjustments are made to the Contract Sum related to this Definition.

B. Base Bid: The amount for which the Bidder proposes to perform Work, not including that work for which Alternative Bid items and Substitutes are also submitted.

1.03 PROCEDURES

A. Coordination: Modify or adjust affected adjacent work as necessary to completely integrate work of the alternate or substitute into the Project.

1. Include as part of each Alternate or Substitute, miscellaneous devices, accessory objects and similar items incidental to or required for a complete installation whether or not indicated as part of the alternate.

B. Notification: Following award of the Contract, Engineer shall notify each party involved, in writing, of the status of each alternate or Substitute equipment. Engineer shall indicate if alternates and substitutes have been accepted, rejected, or deferred for later consideration. Where applicable, Contractor shall include a complete description of negotiated modifications to alternates or Substitutes offered.

C. Execute accepted alternates under the same conditions as other work of the Contract.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 SCHEDULE OF ALTERNATIVES

A. A complete Schedule of Bid Alternates is detailed within the Bid Form Section 00 41 00 and other Division 0 Sections.

END OF SECTION

SECTION 01 30 00

ADMINISTRATIVE REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Preconstruction meeting.

B. Progress meetings

C. Construction progress schedule

D. Submittals for review, information and project closeout

E. Number of copies of submittals

F. Submittal procedures

1.02 RELATED SECTIONS

A. Document 00 70 00 - General Conditions: Dates for applications for payment

B. Document 00 70 00 - General Conditions: Duties of the Construction Manager

C. Section 01 70 00 - Execution and Closeout Requirements: Additional coordination requirements

D. Section 01 78 00 - Closeout Submittals: Project record documents

E. Sections throughout these specifications may include other submittals that may be required for construction

1.03 PROJECT COORDINATION

A. Project Coordinator: Alliance Consulting Engineers, Inc.

B. Cooperate with the Project Coordinator on the site for allocation of mobilization areas; for field offices and sheds, for access, traffic, and parking facilities

C. During construction, coordinate use of site and facilities through the Project Coordinator

D. Comply with Project Coordinator's procedures for intra-project communications; submittals, reports and records, schedules, coordination drawings, and recommendations; and resolution of ambiguities and conflicts.

E. Comply with instructions of the Project Coordinator for use of temporary utilities and construction facilities.

F. Coordinate field engineering and layout work under instructions of the Project Coordinator.

G. Make the following types of submittals through the Project Coordinator:

1. Requests for interpretation.

2. Requests for substitution.

3. Shop drawings, operation and maintenance manuals, product data, and samples.

4. Manufacturer's instructions and field reports.

5. Applications for payment and change order requests.

6. Progress schedules.

7. Coordination drawings.

8. Closeout submittals.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 PRECONSTRUCTION MEETING

A. Engineer will schedule a meeting within thirty (30) days after the Owner has determined the low bidder and may be held prior to issuance of the Notice to Proceed when required by regulatory agencies having jurisdiction. In any event, the Meeting will be held prior to actual start of construction.

B. For the individuals designated by the Contractor, his subcontractors and suppliers attending the Preconstruction Meeting, provide required authority to commit the entities they represent to solutions agreed upon in the meeting.

C. Advise the Engineer at least twenty-hours (24) in advance of the meeting to add items to the agenda.

D. Attendance Required:

1. Owner.

2. Engineer.

3. Contractor.

4. Subcontractors, as needed.

5. Utility Providers

6. Permit Agents

E. Agenda:

1. Execution of Owner-Contractor Contract Agreement.

2. Distribution of Contract Documents.

3. Arrangement of Contractor's forces and personnel and those of subcontractors, material suppliers and the Engineer.

4. Channels and procedures for communication.

5. Designation of personnel representing the parties to Contract, Contractor, Owner and Engineer.

6. Procedures and processing of field decisions, submittals and substitutions, applications for payments, proposal request, Change Orders and Contract closeout procedures.

7. Scheduling.

8. Scheduling activities of a Geotechnical Engineer

9. Rules and regulations governing performance of the Work for security, quality control, housekeeping and related matters.

F. Preconstruction Meeting minutes will be recorded and distributed within ten (10) days after meeting to participants, with three (3) copies to the Contractor and the required number of copies to the Owner, and those affected by decisions being made.

3.02 PROGRESS MEETINGS

A. Engineer will make arrangements for meetings, prepare agenda with copies for participants, and preside at meetings. Contractor must advise the Engineer within forty-eight (48) hours of advance notice of the meeting to add items to the agenda.

B. The Contractor's relations with his subcontractors and material suppliers, and discussions with regards to these items are the Contractor's responsibility and normally not part of the project meeting agenda.

C. For the individuals designated by the Contractor to attend and participate in the project meetings, provide required authority to commit the Contractor to solutions agreed upon in the project meetings.

D. Attendance Required: Job superintendent, major Subcontractors and suppliers, Owner, Engineer, as appropriate to agenda topics for each meeting.

E. Meeting Schedule:

1. Project Meetings will be held monthly or as determined by the Engineer and Owner during construction.

2. Coordinate as necessary to establish mutually acceptable schedule for meetings.

F. Meeting Location: The Engineer will establish the meeting location, and where possible the meetings will be held at the project site or a location near the project site.

G. Agenda:

1. Review minutes of previous meetings.

2. Review of Work progress.

3. Field observations, problems, and decisions.

4. Identification of problems that impede, or will impede, planned progress.

5. Review of submittals schedule and status of submittals.

6. Maintenance of progress schedule.

7. Corrective measures to regain projected schedules

8. Planned progress during succeeding work period.

9. Maintenance of quality and work standards.

10. Effect of proposed changes on progress schedule and coordination.

11. Other business relating to Work.

H. Project Meeting minutes will be recorded and distributed within ten (10) days after meeting to participants, with three (3) copies to the Contractor and the required number of copies to the Owner, and those affected by decisions made.

I. Revisions to Meeting Minutes:

1. Unless published minutes are challenged in writing prior to the next regularly scheduled progress meeting, the minutes will be accepted as properly stating the activities and decisions of the meeting.

2. Individuals challenging published minutes shall reproduce and distribute copies of the challenge for review by all parties affected.

3. Challenge to minutes shall be settled as priority portion of "old business" at the next regularly scheduled meeting.

3.03 CONSTRUCTION PROGRESS SCHEDULE

A. Submit updated schedule with each Application for Payment.

3.04 SUBMITTALS FOR REVIEW

A. When the following are specified in individual sections, submit them for review:

1. Product data.

2. Shop drawings.

3. Samples for selection.

4. Samples for verification.

B. Submit to Engineer for review for the limited purpose of checking for conformance with information given and the design concept expressed in the Contract Documents.

C. Samples

1. Provide sample or samples identical to the precise article proposed to be provided.

Identify as described under “Identification of submittals" below.

2. Number of samples required:

a. Unless otherwise specified, submit samples in the quantity which is required to be returned, plus one which will be retained by the Engineer.

b. By pre-arrangement in specific cases, a single sample may be submitted for review and, when approved, be installed in the work at a location agreed upon by the Engineer.

D. Colors and Patterns

1. Unless the precise color and pattern is specifically called out in the Contract Documents, and whenever a choice of color or pattern is available in the specified products, submit accurate color and pattern charts to the Engineer for selection and confirmation with the Owner.

E. After review, provide copies and distribute in accordance with SUBMITTAL PROCEDURES article below.

3.05 SUBMITTALS FOR INFORMATION

A. When the following are specified in individual sections, submit them for information:

1. Design data.

2. Certificates.

3. Test reports.

4. Inspection reports.

5. Manufacturer's instructions and literature.

6. Manufacturer's field reports.

7. Other types indicated.

B. Submit for Engineer's knowledge as contract administrator or for Owner

3.06 SUBMITTALS FOR PROJECT CLOSEOUT

A. When the following are specified in individual sections, submit them at project closeout:

1. Project record documents.

2. Operation and maintenance data.

3. Warranties and Bonds.

4. Keys and Keying Schedule.

5. Spare parts and manuals.

6. Evidence of payment and release of liens per the General Conditions.

7. Section 00 65 19.13 - Contractor's Affidavit.

8. Other types as indicated.

B. Submit for Owner's benefit during and after project completion.

3.07 NUMBER OF COPIES OF SUBMITTALS

A. Documents for Review:

1. Shop Drawings

a. Scale and Measurement: Make shop drawings accurately to a scale of sufficiently large to show all pertinent aspects of the item and its method of connection to the Work.

b. Large Prints (11" X 17" or larger):

i. Submit shop drawings in the form of white copies.

ii. Blueprints will not be acceptable.

c. Manufacturer's Literature:

i. Where contents of submitted literature from manufacturers includes data not pertinent to the submittal, clearly show which portions of the contents are being submitted for review.

ii. Submit the number of copies which are required to be returned, plus three (3) copies which will be retained by the Engineer.

d. Do not begin fabrication of equipment or materials prior to Engineer's approval of shop drawings.

B. Documents for Information: Submit three (3).

C. Documents for Project Closeout: Make one (1) reproduction of submittal originally reviewed. Submit one (1) extra of submittals for information.

D. Samples: Submit the number specified in individual specification sections; one (1) of which will be retained by Engineer.

1. After review, produce duplicates.

2. Retained samples will not be returned to Contractor unless specifically so stated.

3.08 SUBMITTAL PROCEDURES

A. Transmit each submittal with a Cover Letter that stipulates that the items submitted comply or do not comply with the full extent of the specifications. The Cover Letter must also include an explanation of why the items submitted are considered equal to the items specified. Failure to submit a Cover Letter will result in a rejection of the submittal.

B. Timing of Submittals:

1. Within fifteen (15) calendar days after the Contractor has received the Owner's notice to proceed, submit:

    a. Schedule for submittals including specification section, type of submittal and submittal date.

    b. Construction schedule.

    c. Schedule of partial payment requests.

2. Make submittals of shop drawings, samples, substitution requests and other items in accordance with the provisions of this Section.

C. Quality Assurance:

1. Coordination of submittals:

    a. Prior to each submittal, carefully review and coordinate all aspects of each item being submitted.

    b. Verify that each item and the submittal for it conform in all respects with the specified requirements.

    c. By affixing the Contractor's signature to each submittal, certify that this coordination has been performed.

2. The following products do not require further approval except for interface within the Work and where otherwise indicated.

    a. Products specified by reference to standard specifications such as ASTM, AWWA, and similar standards.

    b. Products specified by manufacturer's name and catalog model number.

3. Or equal:

    a. Where the phrase "or equal" occurs in the Contract Documents, do not assume that the materials, equipment or methods will be considered as equal unless the item has been specifically so approved for this Work by the Engineer.

    b. The decision of the Engineer shall be final.

4. The Engineer shall assume that no shop drawing or related submittal comprises a variation unless the Contractor advises the Engineer otherwise in writing.

D. Sequentially number submittal in the Cover Letter. Revise submittals with original number and a sequential alphabetic suffix.

E. Before submitting a shop drawing or any related material, Contractor shall:

1. Review each such submission for conformance with the means, methods, techniques, sequences, and operations of construction, and safety precautions and programs incidental thereto, all of which are the sole responsibility of Contractor.

2. Approve each such submission before submitting it.

3. Stamp each such submission before submitting it.

F. Shop drawings and related materials shall be returned with comments provided that each submission has been specified and is stamped by the Contractor.

G. Shop drawings or material not specified or which have not been approved by the Contractor shall be returned without comment.

H. Apply Contractor's stamp, signed or initialed certifying that review, approval, verification of Products required, field dimensions, adjacent construction Work and coordination of information is in accordance with the requirements of the Work and Contract Documents. The following stamp shall be used on all shop drawings: "This Shop Drawing has been reviewed by [Name of Contractor] and approved in accordance with the ways, means, methods, techniques, sequences and procedures associated with the project construction. [Name of Contractor] has approved these Shop Drawings in accordance with safety precautions and programs incidental thereto, and warrants that these Shop Drawings comply with the Contract Documents and includes no variations from the specifications."

Signature
Name and Title (Please Print)
Date

I. Identification of Submittals

1. Consecutively number all submittals.

a. When material is resubmitted for any reason, transmit under a new letter of transmittal and with a new transmittal number.

b. On resubmittals, cite the original submittal number for reference.

2. Accompany each submittal with a letter of transmittal showing all information required for identification and checking.

3. On at least the first page of each submittal, and elsewhere as required for positive identification, show the submittal number in which the item was included.

4. Maintain an accurate submittal log for the duration of the work, showing current status of all submittals at all times. Make the submittal log available to the Engineer for his review upon request.

J. Unrequired submittals will not be reviewed by the Engineer.

K. Submittals required by the Contractor of his subcontractors, such as drawings, setting diagrams or similar information needed to coordinate the construction, shall remain between the Contractor and his subcontractors and these submittals will not be reviewed by the Engineer.

L. Grouping of Submittals

1. Unless otherwise specified, make submittals in groups containing all associated items to assure that information is available for checking each item when it is received.

a. Partial submittals may be rejected as not complying with the provisions of the Contract.

b. The Contractor may be held liable for delays so occasioned.

M. Timing of Submittals

1. Make submittals far enough in advance of scheduled dates for installation to provide time required for reviews, for securing necessary approvals, for possible revisions and resubmittals, and for placing orders and securing delivery.

N. Resubmittal Schedule

1. For submittals marked "Furnish as Corrected" by the Engineer, resubmittal shall be within fifteen (15) days of the review date shown on the Engineer's shop drawing review stamp.

2. For submittals marked "Revise and Resubmit", "Submit Specified Item", or "Rejected", resubmittal shall be within fifteen (15) days of the review date shown on the Engineer's shop drawing review stamp.

O. Engineer's Review

1. Review by the Engineer does not relieve the Contractor from responsibility for errors which may exist in the submitted data.

2. Revisions:

a. Make revisions required by the Engineer.

i. If the Contractor considers any required revision to be a change, he shall so notify the Engineer as provided for in the General Conditions.

ii. Make only those revisions directed or approved by the Engineer.

iii. Submittals which have been reviewed and returned to the Contractor marked "Revise and Resubmit" or "Rejected" and which are resubmitted and not in an approved state, will not be reviewed a third time unless payment for the third and any subsequent review is by the Contractor. The engineering costs for review shall be equal to the Engineer's charges to the Owner under the terms of the Engineering Agreement with the Owner.

P. Deliver submittals to Engineer at business address.

Q. Schedule submittals to expedite the Project, and coordinate submission of related items.

R. For each submittal for review, allow twenty-five (25) working days excluding delivery time to and from the Contractor.

S. Identify variations from Contract Documents and Product or system limitations that may be detrimental to successful performance of the completed Work.

T. Provide space for Contractor and Engineer review stamps.

U. When revised for resubmission, identify all changes made since previous submission.

V. Distribute copies of reviewed submittals as appropriate. Instruct parties to promptly report any inability to comply with requirements.

W. Submittals not requested will not be recognized or processed.

END OF SECTION

SECTION 01 31 00

CONSTRUCTION SCHEDULES

PART 1 GENERAL

1.01 DESCRIPTION

A. Work included: Construction Schedules are to be prepared to provide assurance of project planning and the execution of the work so that the construction is completed within the construction period as stated in the Contract Documents, and to provide Alliance Consulting Engineers, Inc. a means to evaluate the progress of the work.

B. Related work:

1. Documents affecting work of this Section include, but are not necessarily limited to, General Conditions, and Sections in Division 01 of these Specifications.

2. General Conditions and the requirements associated with the progress schedule.

3. Construction period: As related to the executed contract.

C. Definitions: "Day", means calendar day.

1.02 QUALITY ASSURANCE

A. The Contractor is to provide a scheduler that is thoroughly trained and experienced in preparing construction schedule data, and in preparing and issuing periodic schedule reports as stated below.

B. Perform data preparation that includes analysis, charting and updating as required.

C. Reliance upon the approved schedule:

1. Once approved by Alliance Consulting Engineers, Inc., the construction schedule will be an integral part of the Contract and will establish interim completion dates for the various construction tasks specified in the Contract.

2. The Contractor agrees and understands that the failure of the Owner to exercise this option either to order the Contractor to expedite an activity or to expedite the activity by other means shall not be considered a precedent for any other scheduled activities.

1.03 SUBMITTALS

A. Comply with provisions of Section 01 30 00 Administrative Requirements.

B. Once the preliminary schedule has been reviewed and approved by Alliance Consulting Engineers, Inc., within ten (10) calendar days, the Contractor must submit one (1) reproducible copy and four (4) prints of a preliminary construction schedule prepared in accordance with Part 3 of this Section.

C. Once the Contractor receives final review and approval of the preliminary construction

schedule, the Contractor must submit within ten (10) calendar days one (1) reproducible copy and four (4) prints of a construction schedule prepared in accordance with Part 3 of this Section.

D. The Contractor must also provide on the first working day of each month, four (4) prints of the construction schedule that has been updated in accordance with Part 3 of this Section.

PART 2 PRODUCTS

2.01 CONSTRUCTION ANALYSIS

A. The construction schedule must illustrate graphically by bar chart the order and interdependence of all construction activities required to complete the work, and the sequence in which the construction activities are to be completed. All construction activities must be planned by the Contractor and his project field superintendent in coordination with all subcontractors whose work is shown on the diagram and any other work being completed on the project site by other contractors that requires coordination.

1. The graphical chart must be a two (2) line bar chart; with one (1) bar for planned activities, and one (1) bar for actual activity completion.

B. Include, but do not necessarily limit indicated activities to:

1. Project mobilization.

2. Submittal and approval of shop drawings and sample data.

3. Procurement of equipment and critical materials.

4. Fabrication of special material and equipment, and its installation and testing.

5. Each construction activity that is critical to the work being performed.

6. All activities by Alliance Consulting Engineers, Inc. that affect progress, required dates for completion, or both, for all and each part of the Work.

7. All activities by other contractors that have to be coordinated with the work being completed under this Contract.

8. Final cleanup.

9. Final inspecting and testing.

PART 3 EXECUTION

3.01 PRELIMINARY ANALYSIS

A. Contents:

1. Outline the activities of the Contractor for the period between receipt of Notice to Proceed and submittal of construction schedule.

2. Outline the Contractor's approach to the remaining work to be completed.

3. Outline the costs of all activities scheduled before submittal and approval of the construction schedule.

3.02 CONSTRUCTION SCHEDULE

A. Provide a construction schedule that incorporates all of the revisions from review of the preliminary analysis.

3.03 PERIODIC REPORTS

A. Provide monthly updates of the approved construction schedule.

1. Indicate "actual" progress for each activity on the bar chart.

2. Provide written narrative summary of revisions causing delay in the construction, and an explanation of corrective actions being taken or proposed.

3.04 REVISIONS

A. Provide a revised construction schedule periodically that includes delays, early completion, etc.

B. Any revisions to the construction schedule must be approved by Alliance Consulting Engineers, Inc. before acceptance.

END OF SECTION

SECTION 01 32 00

PROJECT CONSTRUCTION SEQUENCE AND PROVISIONS

PART 1 GENERAL

1.01 CONSTRUCTION AREAS

A. The Contractor shall limit his use of the construction areas for work and for storage to allow for:

1. Work by other Contractors.
2. Owner use.
3. Public use.

B. Coordinate use of work site under direction of Engineer.

C. Assume full responsibility for the protection and safekeeping of materials and products under this Contract, stored on the site.

D. Move any stored products, under Contractor's control, which interfere with operations of the OWNER or separate Contractor.

E. Obtain and pay for the use of additional storage of work areas needed for operations.

1.02 SPECIFICATIONS

A. Specifications

The Technical Specifications consist of three parts: General, Products and Execution. The General Section contains General Requirements which govern the work. Products and Execution modify and supplement these by detailed requirements of the work and shall always govern whenever there appears to be a conflict.

B. Intent

All work called for in the Specifications applicable to this Contract, but not shown on the plans in their present form, or vise versa, shall be of like effect as if shown or mentioned in both. Work not specified in either the plans or the Specifications, but involved in carrying out their intent or in the complete and proper execution of the work is required and shall be performed by the Contractor as though it were specifically delineated or described.

The apparent silence of the specifications as to any detail, or the apparent omission from them of a detailed description concerning any work to be done and materials to be furnished, shall be regarded as meaning that only the best general practice is to prevail and that only material and workmanship of the best quality is to be used, and interpretation of these specifications shall be made upon that basis. The inclusion of the General Requirements (or work specified elsewhere) in the General part of the specifications is only for the convenience of the Contractor, and shall not be interpreted as a complete list of related Specification Sections.

1.03 WORK IN PROGRESS

The Contractor shall furnish personnel and equipment which will be efficient, appropriate, and adequately sized to secure a satisfactory quality of work and a rate of progress which will insure the completion of the work within the time stipulated in the Proposal. If at any time such personnel

appears to the Engineer to be inefficient, inappropriate, or insufficient for securing the quality of work required for producing the rate of progress aforesaid, he may order the Contractor to increase the efficiency, change the character, or increase the personnel and equipment, and the Contractor shall conform to such order. Failure of the Engineer to give such order shall in no way relieve the Contractor of his obligations to secure the quality of the work and rate of progress required.

1.04 UTILITY SYSTEMS AND FACILITIES

A. The Contractor shall interrupt water, telephone, power, cable TV, sewer, gas or other related utility services and disturb the normal functioning of the system as little as possible. He shall notify the Engineer and the appropriate agency well in advance of any requirements for dewatering, isolating, or relocating a section of a utility, so that necessary arrangements may be made with the appropriate agency.

B. The Contractor shall assume full responsibility for the protection of all buildings, structures, and utilities, public or private, including poles, signs, services to buildings, utilities in the street, gas pipes, water pipes, hydrants, sewers, storm drains and electric and telephone cables, whether or not they are shown on the Drawings. The Contractor shall carefully support and protect all such structures and utilities from injury of any kind. Any damage resulting from the Contractor's operations shall be repaired by him/her at his/her expense.

C. The Contractor shall bear full responsibility for obtaining locations of all underground structures and utilities (including existing water services, drain lines, and sewers). Services to buildings shall be maintained, and all costs or charges resulting from damage thereto shall be paid by the Contractor.

D. Protection and temporary removal and replacement of existing utilities and structures as described in this Section shall be a part of the work under the Contract and no separate payment will be made for this work.

E. If, in the opinion of the Engineer, permanent relocation of a utility owned by the Owner is required, he may direct the Contractor in writing, to perform the work. Work so ordered will be paid for at the contract unit prices, if applicable, or as extra work. If relocation of a privately owned utility is required, the Owner will notify the utility to perform the work as expeditiously as possible. The Contractor shall fully cooperate with the Owner and utility and shall have no claim for delay due to such relocation. The Contractor shall notify all utility companies in writing at least 48 hours (excluding Saturdays, Sundays, and legal holidays) before excavating near their utilities.

F. The Contractor shall be responsible to maintain water, telephone, power, cable TV, sewer, gas and other related utilities throughout construction at no additional cost to the Owner.

G. The Contractor shall fully cooperate with all private and public utilities during the installation of new facilities, or relocation of existing facilities. The Contractor shall coordinate his work accordingly and shall have no claim except for time extension for delays associated with the proposed utility improvements.

1.05 TEST PITS

A. Test pits for the purpose of locating underground pipeline or structures in advance of the construction shall be excavated and backfilled by the Contractor at the direction of the Engineer. Test pits shall be backfilled immediately after their purpose has been satisfied and the surface restored and maintained in a manner satisfactory to the Engineer. No separate payment will be made.

1.06 CARE AND PROTECTION OF PROPERTY

A. The Contractor shall be responsible for the preservation of all public and private property, and shall use every precaution necessary to prevent damage thereto. If any direct or indirect damage is done to public or private property by or on account of any act, omission, neglect, or misconduct in the execution of the work on the part of the Contractor, such property shall be restored by the Contractor, at his expense, to a condition similar or equal to that existing before the damage was done, or he shall make good the damage in another manner acceptable to the Engineer.

B. All sidewalks and driveways which are disturbed by the Contractor's operations shall be restored to their original or better condition by the use of similar or comparable materials.

C. Along the location of this work all fences, walks, bushes, trees, shrubbery, and other physical features shall be protected and restored in a thoroughly workmanlike manner. Fences and other features removed by the Contractor shall be replaced in the location indicated by the Engineer as soon as conditions permit. All grass areas beyond the limits of construction which have been damaged by the Contractor shall be regraded and seeded.

D. Trees close to the work shall be boxed or otherwise protected against injury. The Contractor shall trim all branches that are liable to damage because of his operations, but in no case shall any tree be cut or removed without prior notification of the tree warden. All injuries to bark, trunk, limbs, and roots of trees shall be repaired by dressing, cutting, and painting according to approved methods, using only approved tools and materials.

E. The protection, removal, and replacement of existing physical features along the line of work shall be a part of the work under the Contract, and all costs in connection therewith shall be included in the unit and/or lump sum prices established under other items in the Proposal.

1.07 CLEAN-UP

A. During the course of the work, the Contractor shall keep the site of his operations in as clean and neat of a condition as is possible. He shall dispose of all residue resulting from the construction work and, at the conclusion of the work, he shall remove and haul away any surplus excavation, broken pavement, brick, lumber, equipment, temporary structures, and any other refuse remaining from the construction operations, and shall leave the entire site of the work in a neat and orderly condition.

B. In order to prevent environmental pollution arising from the construction activities related to the performance of this Contract, the Contractor and his/her subcontractors shall comply with all applicable Federal, State and local laws and regulations concerning waste material disposal, as well as the specific requirements stated in this Section and elsewhere in the Specifications.

C. The Contractor is advised that the disposal of excess excavated material in wetlands, stream corridors and plains is strictly prohibited even if the permission of the property owner is obtained. Any violation of this restriction by the Contractor or any person employed by him, will be brought to the immediate attention of the responsible regulatory agencies, with a request that appropriate action be taken against the offending parties. The Contractor will be responsible to pay all fines, remove the fill, and restore the area impacted.

1.08 PROTECTION OF CONSTRUCTION AND EQUIPMENT

A. All newly constructed work shall be carefully protected from injury in any way. No wheeling or walking or placing of heavy loads on it shall be allowed and all portions injured shall be reconstructed by the Contractor at his own expense.

B. All structures shall be protected in a manner approved by the Engineer. Should any of the structures become heaved, cracked, or otherwise damaged, all such damaged portions of the work shall be completely repaired and made good by the Contractor, at his own expense, and to the satisfaction of the Engineer. If, in the final inspection of the work, any defects, faults, or omissions are found, the Contractor shall cause the same to be repaired or removed and replaced by proper materials and workmanship without extra compensation for the materials and labor required. Further, the Contractor shall be fully responsible for the satisfactory maintenance and repair of the construction and other work undertaken herein, for at least the guarantee period described in the Contract.

C. Further, the Contractor shall take all necessary precautions to prevent damage to any structure due to water pressure during and after construction and until such structure is accepted and taken over by the Owner.

1.09 PROJECT SEQUENCING

Construct work in stages to accommodate operation of existing facilities during construction period. Coordinate construction schedule and operations with the Owner and the Engineer. Owner reserves the right to place facilities, taken out of service by Contractor, back into service on emergency basis upon notification to Contractor.

PART 2 PRODUCTS – NOT USED

PART 3 EXECUTION – NOT USED

END OF SECTION

SECTION 01 40 00

QUALITY REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. References and standards.

B. Quality assurance submittals

C. Control of installation.

D. Inspection services.

E. Cooperate with the Owner's selected testing agency and all others responsible for testing and inspecting the work.

F. Provide such other testing and inspecting as are specified to be furnished by the Contractor in this Section and/or elsewhere in the Contract Documents.

1.02 RELATED REQUIREMENTS

A. Section 01 30 00 - Administrative Requirements: Submittal procedures.

B. Section 01 60 00 - Product Requirements: Requirements for material and product quality.

C. Requirements for testing may be described in various Sections of these specifications.

D. Where no testing requirements are described, but the Owner decides that testing is required, the Owner may require such testing to be performed under current pertinent standards for testing. Payment for such testing will be made as described in this Section.

1.03 ADDITIONAL WORK INCLUDED:

A. Selection of testing laboratory: The contractor shall provide all necessary testing by a prequalified independent testing laboratory. This information shall be provided to the Engineer for approval during the shop drawing review process.

B. Payment for initial testing: The selected contractor’s contract shall provide all necessary services of the testing laboratory within the contract prices to the owner as further described in Article 2.1 of this Section.

C. Tests at point of manufacture as specified in other Sections of these documents are to be made with all costs borne by the Contractor.

1.04 REFERENCE STANDARDS

A. ASTM C 1077 - Standard Practice for Laboratories Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Laboratory Evaluation; 2009.

B. ASTM D 3740 - Standard Practice for Minimum Requirements for Agencies Engaged in the Testing and/or Inspection of Soil and Rock as Used in Engineering Design and

Construction; 2008.

C. ASTM E 329 - Standard Specification for Agencies Engaged Construction Inspection and/or Testing; 2009.

1.05 SUBMITTALS

A. Testing Agency Qualifications:

1. Prior to start of Work, submit agency name, address, and telephone number, and names of full time registered Engineer and responsible officer.

B. Test Reports: After each test/inspection, promptly submit three (3) copies of report to Alliance Consulting Engineers, Inc. and to Owner.

1. Include:

a. Date issued.

b. Project title and number

c. Name of inspector

d. Date and time of sampling or inspection

e. Identification of product and specifications section

f. Location in the Project

g. Type of test/inspection

h. Date of test/inspection

i. Results of test/inspection

j. Conformance with Contract Documents

k. When requested by Alliance Consulting Engineers, Inc., provide interpretation of results.

2. Test report submittals are for Alliance Consulting Engineers Inc.'s knowledge as contract administrator for the limited purpose of assessing conformance with information given and the design concept expressed in the contract documents, or for Owner information

C. Certificates: When specified in individual specification sections, submit certification by the manufacturer and Contractor or installation/application subcontractor to Alliance Consulting Engineers, Inc., in quantities specified for Product Data.

1. Indicate material or product conforms to or exceeds specified requirements. Submit supporting reference data, affidavits, and certifications as appropriate.

2. Certificates may be recent or previous test results on material or product, but must be acceptable to Alliance Consulting Engineers, Inc.

D. Manufacturer's Instructions: When specified in individual specification sections, submit

printed instructions for delivery, storage, assembly, installation, start-up, adjusting, and finishing, for the Owner's information. Indicate special procedures, perimeter conditions requiring special attention, and special environmental criteria required for application or installation.

1.06 REFERENCES AND STANDARDS

A. For products and workmanship specified by reference to a document or documents not included in the Project Manual, also referred to as reference standards, comply with requirements of the standard, except when more rigid requirements are specified or are required by applicable codes.

B. Conform to reference standard of date of issue current on date of Contract Documents, except where a specific date is established by applicable code.

C. Obtain copies of standards where required by product specification sections.

D. Maintain copy at project site during submittals, planning, and progress of the specific work, until Substantial Completion.

E. Should specified reference standards conflict with Contract Documents, request clarification from Alliance Consulting Engineers, Inc. before proceeding.

F. Neither the contractual relationships, duties, nor responsibilities of the parties in Contract nor those of Alliance Consulting Engineers, Inc. shall be altered from the Contract Documents by mention or inference otherwise in any reference document.

1.07 QUALITY ASSURANCE

A. The testing laboratory will be qualified to the Owner's approval in accordance with ASTM E 329.

B. Testing, when required, will be in accordance with all pertinent codes and regulations, and with selected standards of the American Society for Testing and Materials.

1.08 PRODUCT HANDLING

A. Comply with pertinent provisions of Section 01 60 00 Product Requirements.

B. Promptly process and distribute required copies of test reports and related instructions to assure necessary retesting and replacement of materials with the least possible delay in progress of the work.

PART 2 PRODUCTS

2.01 PAYMENT FOR TESTING

A. Testing Services:

1. The Contractor will pay for all testing services required by the contract documents and manufacturer's recommendations except for aggregate and compaction testing.

2. When initial tests indicate non-compliance with the Contract Documents, any all retesting and consulting required to provide compliance with the Contract Documents will the responsibility of the contractor at no additional costs to the

Owner.

3. Retesting: When initial tests indicate non-compliance with the Contract Documents, subsequent re-testing occasioned by the non-compliance shall be performed by the same testing agency.

2.02 CODE COMPLIANCE TESTING

A. Inspections and tests required by codes or ordinances, or by a plan approval authority, and which are made by a legally constituted authority, shall be the responsibility of and shall be paid for by the Contractor, unless otherwise provided in the Contract Documents.

2.03 CONTRACTOR'S CONVENIENCE TESTING

A. Inspecting and testing performed exclusively for the Contractor's convenience shall be the sole responsibility of the Contractor.

PART 3 EXECUTION

3.01 CONTROL OF INSTALLATION

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

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

C. Should manufacturers' instructions conflict with Contract Documents, request clarification from Alliance Consulting Engineers, Inc. before proceeding.

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

E. Have Work performed by persons qualified to produce required and specified quality.

F. Verify that field measurements are as indicated on shop drawings or as instructed by the manufacturer.

G. Secure products in place with positive anchorage devices designed and sized to withstand stresses, vibration, physical distortion, and disfigurement.

3.02 CONTRACTOR TESTING COORDINATION:

A. Cooperation with Testing Laboratory:

1. Representatives of the testing laboratory shall have access to the work at all times and at all locations where the work is in progress. Provide facilities for such access to enable the laboratory to perform its functions properly.

B. Taking Specimens:

1. All specimens and samples for testing, and deliveries to laboratory, unless otherwise provided in the Contract Documents, shall be taken by the testing personnel. All sampling equipment and personnel will be provided by the testing

laboratory. All deliveries of specimens and samples to the testing laboratory will be performed by the testing laboratory.

3.03 SCHEDULES FOR TESTING

A. Establishing schedule:

1. By advance discussion with the testing laboratory selected by the Owner, determine the time required for the laboratory to perform its tests and to issue each of its findings.

2. Provide all required time within the construction schedule.

B. Revising schedule: When changes of construction schedule are necessary during construction, coordinate all such changes with the testing laboratory as required.

C. Adherence to schedule: When the testing laboratory is ready to test according to the established schedule, but is prevented from testing or taking specimens due to incompleteness of the work, all extra charges for testing attributable to the delay may be back-charged to the Contractor and shall not be borne by the Owner.

3.04 TESTING AND INSPECTION

A. Testing Agency Duties:

1. Provide qualified personnel at site. Cooperate with Alliance Consulting Engineers, Inc. and Contractor in performance of services.

2. Perform specified sampling and testing of products in accordance with specified standards.

3. Ascertain compliance of materials and mixes with requirements of Contract Documents.

4. Promptly notify Alliance Consulting Engineers, Inc. and Contractor of observed irregularities or non-conformance of Work or products.

5. Perform additional tests and inspections required by Alliance Consulting Engineers, Inc.

6. Submit reports of all tests/inspections specified.

B. Limits on Testing/Inspection Agency Authority:

1. Agency may not release, revoke, alter, or enlarge on requirements of Contract Documents.

2. Agency may not approve or accept any portion of the Work.

3. Agency may not assume any duties of Contractor.

4. Agency has no authority to stop the Work.

C. Contractor Responsibilities:

1. Provide incidental labor and facilities:

   a. To provide access to Work to be tested/inspected

   b. To facilitate tests/inspections

2. Notify Alliance Consulting Engineers, Inc. and laboratory twenty-four (24) hours prior to expected time for operations requiring testing/inspection services.

3. Employ services of an independent qualified testing laboratory and pay for additional samples, tests, and inspections required by Contractor beyond specified requirements.

4. Arrange with the Owner's agency and pay for additional samples, tests, and inspections required by Contractor beyond specified requirements.

D. Re-testing required because of non-conformance to specified requirements shall be performed by the same agency on instructions by Alliance Consulting Engineers, Inc.

E. Re-testing required because of non-conformance to specified requirements shall be paid for by Contractor.

F. Re-testing required because of non-conformance to specified requirements shall be performed by the same agency on instructions by Alliance Consulting Engineers, Inc. Payment for re testing will be charged to the Contractor by deducting testing charges from the Contract Price.

3.05 DEFECT ASSESSMENT

A. Replace Work or portions of the Work not conforming to specified requirements.

B. If, in the opinion of Alliance Consulting Engineers, Inc., it is not practical to remove and replace the Work, Alliance Consulting Engineers, Inc. will direct an appropriate remedy or adjust payment.

END OF SECTION

SECTION 01 41 26

PERMITS AND RIGHTS-OF-WAY

PART 1 GENERAL

1.01 DESCRIPTION

A. Work included: This section outlines the requirements of the Contractor for the payment for any fees and the acquisition of any required licenses, building permits, rights-of-ways, easements, etc., that may be required for the construction of the project.

B. Work not included: The Owner will obtain and provide to the Contractor, copies of the following, if required:

1. South Carolina Department of Health and Environmental Control, NPDES, General Permit for Construction Activities.

2. South Carolina Department of Transportation, Encroachment Permit to remove driveway on Brown Street (S-42).

3. Newberry County Roads and Bridge Maintenance, Permit to encroach with new driveway on Shiloh Street.

C. Related work: Documents affecting work of this section include, but are not necessarily limited to, General Conditions and Sections in Division 01 of these specifications.

1.02 SUBMITTALS

A. Submit to the Engineer and post at the site, satisfactory evidence that all required licenses, building permits, etc., have been obtained prior to start of construction.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 BUSINESS LICENSE

A. Verify licenses that are required to perform the work within the project area, and obtain at no additional cost to the Owner.

3.02 RIGHTS-OF-WAY, UTILITY LINES

A. The Contractor shall confine his activities to the project limits as illustrated in the Contract Documents.

B. The Owner will provide no right-of-way over other property.

3.03 LAND

A. The necessary land for construction of the proposed improvements will be provided by the Owner.

END OF SECTION

SECTION 01 42 19

REFERENCE STANDARDS

PART 1 GENERAL

1.01 DESCRIPTION

A. Throughout these Contract Documents, references are made to specifications and standards that have been issued by nationally recognized professional and/or trade organizations. These referenced standards are generally identified by abbreviating the name of the organization following with the specification/standard number, and unless specifically indicated otherwise, all references to standards refer to the latest edition available at the time of the bidding.

1.02 ABBREVIATIONS

A. Wherever the following abbreviations are used in these Contract Documents, these abbreviations are to be considered as the same as the respective expressions represented below:

1.	AASHO	American Association of State Highway Officials
2.	ACI	American Concrete Institute
3.	AISC	American Institute of Steel Construction
4.	ALS	American Lumber Standards
5.	ANSI	American National Standards Institute, Inc.
6.	ASTM	American Society for Testing and Materials
7.	AWWA	American Water Works Association
8.	AWPA	American Wood Preservers Association
9.	AWS	American Welding Society
10.	FSS	Federal Specifications and Standards, General Services Administration
11.	SPIB	Southern Pine Inspection Bureau
12.	SSPC	Steel Structures Painting Council

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 01 50 00

TEMPORARY FACILITIES AND CONTROLS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Vehicular access and parking.

1.02 RELATED SECTIONS

A. Section 01 55 10 - Vehicular Access and Parking

1.03 BARRIERS

A. Provide barriers to prevent unauthorized entry to construction areas, to allow for owner's use of site and to protect existing facilities and adjacent properties from damage from construction operations and demolition.

B. Provide barricades and covered walkways required by governing authorities for public rights-of-way and for public access to existing building.

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

1.04 VEHICULAR ACCESS AND PARKING - See Section 01 55 10

A. Coordinate access and haul routes with governing authorities and Owner.

B. Provide and maintain access to fire hydrants, free of obstructions.

C. Provide means of removing mud from vehicle wheels before entering streets.

D. Provide temporary parking areas to accommodate construction personnel. When site space is not adequate, provide additional off-site parking.

1.05 PROJECT IDENTIFICATION – NOT USED

1.06 FIELD OFFICES

Contractor is allowed to locate a construction trailer on site for the contractor’s office use as needed. The power and waste will be contractor’s responsibility. The removal of the facility will be required by the contractor before the project is completed at the contractor’s expense.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 01 55 10

VEHICULAR ACCESS AND PARKING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Access roads.

B. Parking.

C. Maintenance

PART 2 PRODUCTS

2.01 MATERIALS

A. Temporary Construction: Per Detail on Plans

PART 3 EXECUTION

3.01 PREPARATION

A. Clear areas, provide surface and storm drainage of road, parking, area premises, and adjacent areas

3.02 ACCESS ROADS

A. All material shall be delivered to the site by use of the temporary construction entrance from Dixie Drive (SC Highway 34) (SCDOT owned roadway). An encroachment permit will be provided for access into the site as part of the project.

3.03 PARKING

A. Locate temporary parking within the property by Owner/Engineer approval.

3.04 MAINTENANCE

A. Maintain traffic and parking areas in a sound condition free of excavated material, construction equipment, products, mud, snow, and ice.

B. Maintain existing paved areas used for construction. Promptly repair breaks, potholes, low areas, standing water, and other deficiencies, to maintain paving and drainage in original, or specified, condition.

3.05 REMOVAL, REPAIR

A. Remove equipment and devices when no longer required.

B. Repair damage caused by installation.

3.06 MUD FROM SITE VEHICLES

A. Provide means of removing mud from vehicle wheels before entering streets.

END OF SECTION

SECTION 01 60 00

PRODUCT REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. General product requirements.

B. Re-use of existing products.

C. Transportation, handling, storage and protection.

D. Product option requirements.

E. Substitution limitations and procedures.

F. Maintenance materials, including extra materials, spare parts, tools, and software.

G. Protect products scheduled for use in the work by means including, but not necessarily limited to, those described in this Section.

1.02 RELATED REQUIREMENTS

A. Document 00 21 13 - Instructions to Bidders: Product options and substitution procedures prior to bid date.

B. Section 01 40 00 - Quality Requirements: Product quality monitoring.

C. Documents affecting work of this Section include, but are not necessarily limited to, Standard General Conditions of the Construction Contract and Sections in Division 01 of these specifications.

D. Additional procedures also may be prescribed in other Sections of these specifications.

1.03 SUBMITTALS

A. Proposed Products List: Submit list of major products proposed for use, with name of manufacturer, trade name, and model number of each product.

1. Submit within fifteen (15) days after date of Agreement.

2. For products specified only by reference standards, list applicable reference standards.

B. Product Data Submittals: Submit manufacturer's standard published data. Mark each copy to identify applicable products, models, options, and other data. Supplement manufacturers' standard data to provide information specific to this Project.

C. Shop Drawing Submittals: Prepared specifically for this Project; indicate utility and electrical characteristics, utility connection requirements, and location of utility outlets for service for functional equipment and appliances.

D. Sample Submittals: Illustrate functional and aesthetic characteristics of the product, with integral parts and attachment devices. Coordinate sample submittals for interfacing work.

1. For selection from standard finishes, submit samples of the full range of the manufacturer's standard colors, textures, and patterns.

E. Indicate utility and electrical characteristics, utility connection requirements, and location of utility outlets for service for functional equipment and appliances.

1.04 QUALITY ASSURANCE

A. Include within the Contractor's quality assurance program such procedures as are required to assure full protection of work and materials.

1.05 MANUFACTURER'S RECOMMENDATIONS

A. Except as otherwise approved by the Engineer, determine and comply with manufacturer's recommendations on product handling, storage and protection.

PART 2 PRODUCTS

2.01 EXISTING PRODUCTS

A. Do not use materials and equipment removed from existing premises unless specifically required or permitted by the Contract Documents.

B. Unforeseen historic items encountered remain the property of the Owner; notify the Owner promptly upon discovery; protect, remove, handle, and store as directed by the Owner.

C. Existing materials and equipment indicated to be removed, but not to be re-used, relocated, reinstalled, delivered to the Owner, or otherwise indicated as to remain the property of the Owner, become the property of the Contractor; remove from site.

D. Reused Products: Reused products include materials and equipment previously used in this or other construction, salvaged and refurbished as specified.

2.02 NEW PRODUCTS

A. Provide new products unless specifically required or permitted by the Contract Documents.

2.03 PRODUCT OPTIONS

A. Products Specified by Reference Standards or by Description Only: Use any product meeting those standards or description.

B. Products Specified by Naming One or More Manufacturers: Use a product of one of the manufacturers named and meeting specifications, no options or substitutions allowed.

C. Products Specified by Naming One or More Manufacturers with a Provision for Substitutions: Submit a request for substitution for any manufacturer not named.

2.04 MAINTENANCE MATERIALS

A. Furnish extra materials, spare parts, tools, and software of types and in quantities specified in individual specification sections.

B. Deliver to Project site; obtain receipt prior to final payment.

PART 3 EXECUTION

3.01 SUBSTITUTION PROCEDURES

A. Instructions to Bidders specify time restrictions for submitting requests for substitutions during the bidding period. Comply with requirements specified in this section.

B. Alliance Consulting Engineers, Inc. will consider requests for substitutions only within fifteen (15) days after date of Agreement.

C. Document each request with complete data substantiating compliance of proposed substitution with Contract Document

D. A request for substitution constitutes a representation that the submitter:

1. Has investigated proposed product and determined that it meets or exceeds the quality level of the specified product.

2. Will provide the same warranty for the substitution as for the specified product.

3. Will coordinate installation and make changes to other Work that may be required for the Work to be complete with no additional cost to Owner.

4. Waives claims for additional costs or time extension that may subsequently become apparent.

5. Will reimburse the Owner and Alliance Consulting Engineers, Inc. for review or redesign services associated with re-approval by authorities.

E. Substitution Submittal Procedure:

1. Submit three (3) copies of request for substitution for consideration. Limit each request to one proposed substitution.

2. Submit shop drawings, product data, and certified test results attesting to the proposed product equivalence. Burden of proof is on proposer.

3. Alliance Consulting Engineers, Inc. will notify Contractor in writing of decision to accept or reject request.

3.02 PACKAGING

A. Deliver products to the job site in their manufacturer's original container, with labels intact and legible.

1. Maintain packaged materials with seals unbroken and labels intact until time of use.

2. Promptly remove damaged material and unsuitable items from the job site and promptly replace with material meeting the specified requirements, at no additional cost to the Owner.

B. The Engineer may reject as non-complying such material and products that do not bear identification satisfactory to the Engineer as to manufacturer, grade, quality and other pertinent information.

3.03 TRANSPORTATION AND HANDLING

A. Coordinate schedule of product delivery to designated prepared areas in order to minimize site storage time and potential damage to stored materials.

B. Transport and handle products in accordance with manufacturer's instructions.

C. Transport materials in covered trucks to prevent contamination of product and littering of surrounding areas.

D. Promptly inspect shipments to ensure that products comply with requirements, quantities are correct, and products are undamaged.

E. Provide equipment and personnel to handle products by methods to prevent soiling, disfigurement, or damage.

F. Arrange for the return of packing materials, such as wood pallets, where economically feasible.

3.04 STORAGE AND PROTECTION

A. Designate receiving/storage areas for incoming products so that they are delivered according to installation schedule and placed convenient to work area in order to minimize waste due to excessive materials handling and misapplication.

B. Store and protect products in accordance with manufacturers' instructions.

C. Store with seals and labels intact and legible.

D. Store sensitive products in weather tight, climate controlled, enclosures in an environment favorable to product.

E. For exterior storage of fabricated products, place on sloped supports above ground.

F. Cover products subject to deterioration with impervious sheet covering. Provide ventilation to prevent condensation and degradation of products.

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

H. Prevent contact with material that may cause corrosion, discoloration, or staining.

I. Provide equipment and personnel to store products by methods to prevent soiling, disfigurement, or damage.

J. Arrange storage of products to permit access for inspection. Periodically inspect to verify products are undamaged and are maintained in acceptable condition.

K. Partial payments under the Contract will not relieve the Contractor from responsibility.

1. When materials and work at the site that have been partially paid for are not adequately protected by the Contractor, such materials will be protected by the

Owner at the expense of the Contractor and no further partial payment thereon will be made.

L. Maintain finished surfaces clean, unmarred, and suitably protected until accepted by the Owner.

M. Electrical and control equipment:

1. Store in a dry area protected from dust and humidity.

2. Equipment can be protected by a weatherproof cover if shipped to the site no more than two (2) weeks prior to installation and energization.

3.05 REPAIRS AND REPLACEMENTS

A. In the event of damage, promptly make replacements and repairs to the approval of the Engineer and at no additional cost to the Owner.

B. Additional time required to secure replacements and to make repairs will not be considered by the Engineer to justify an extension in the contract time of completion.

END OF SECTION

SECTION 01 70 00

EXECUTION REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Examination, preparation, and general installation procedures.

B. Requirements for alterations work, including selective demolition.

C. Pre-installation meetings.

D. Cutting and patching.

E. Surveying for laying out the work.

F. Cleaning and protection.

G. Starting of systems and equipment.

H. Demonstration and instruction of the Owner's personnel.

I. Project Record Documents.

J. Contract Closeout procedures, except payment procedures.

1.02 RELATED REQUIREMENTS

A. Documents affecting work of this Section include, but are not necessarily limited to, General Conditions, and Sections in Division 01 of these Specifications.

B. Other requirements for technical services are stated in other sections of these Specifications.

C. Section 00 65 19.13 - Contractor's Affidavit.

D. Section 01 30 00 - Administrative Requirements: Submittals procedures.

E. Section 01 40 00 - Quality Requirements: Testing and observation procedures.

F. Section 01 78 00 - Closeout Submittals: Project record documents, operation and maintenance data, warranties and bonds.

1.03 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Survey work: Submit name, address, and telephone number of Surveyor before starting survey work.

1. On request, submit documentation verifying accuracy of survey work.

2. Submit a copy of site drawing signed by the Land Surveyor, with elevations and locations of the work in conformance with Contract Documents.

3. Submit surveys and survey logs for the project record.

C. Cutting and Patching: Submit written request in advance of cutting or alteration that affects:

1. Structural integrity of any element of Project.

2. Integrity of weather exposed or moisture resistant element.

3. Efficiency, maintenance, or safety of any operational element.

4. Visual qualities of sight exposed elements.

5. Work of the Owner or separate Contractor.

1.04 QUALIFICATIONS

A. For survey work, employ a land surveyor registered in South Carolina. Submit an evidence of Surveyor's Errors and Omissions insurance coverage in the form of an Insurance Certificate.

1.05 PROJECT CONDITIONS

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

B. Ventilate enclosed areas to assist cure of materials, to dissipate humidity, and to prevent accumulation of dust, fumes, vapors, or gases.

C. Dust Control: Execute work by methods to minimize raising dust from construction operations.

D. Provide positive means to prevent air-borne dust from dispersing into atmosphere and over adjacent property.

E. Erosion and Sediment Control: Plan and execute work by methods to control surface drainage from cuts and fills, from borrow and waste disposal areas. Prevent erosion and sedimentation.

1. Minimize amount of bare soil exposed at one time.

2. Provide temporary measures such as berms, dikes, and drains, to prevent water flow.

3. Construct fill and waste areas by selective placement to avoid erosive surface silts or clays.

4. Periodically inspect earthwork to detect evidence of erosion and sedimentation; promptly apply corrective measures.

F. Noise Control: Provide methods, means, and facilities to minimize noise produced by construction operations.

G. Pollution Control: Provide methods, means, and facilities to prevent contamination of soil, water, and atmosphere from discharge of noxious, toxic substances, and pollutants produced by construction operations. Comply with federal, state, and local regulations.

1.06 COORDINATION

A. Coordinate scheduling, submittals, and work of the various sections of the Project Manual to ensure efficient and orderly sequence of installation of interdependent construction elements, with provisions for accommodating items installed later.

B. Notify affected utility companies and comply with their requirements.

C. Verify that utility requirements and characteristics of new operating equipment are compatible with building utilities. Coordinate work of various sections having interdependent responsibilities for installing, connecting to, and placing in service, such equipment.

D. Coordinate space requirements, supports, and installation of mechanical and electrical work that are indicated diagrammatically on Drawings. Follow routing shown for pipes, ducts, and conduit, as closely as practicable; place runs parallel with lines of building. Utilize spaces efficiently to maximize accessibility for other installations, for maintenance, and for repairs.

E. In finished areas except as otherwise indicated, conceal pipes, ducts, and wiring within the construction. Coordinate locations of fixtures and outlets with finish elements.

F. Coordinate completion and clean-up of work of separate sections.

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

PART 2 PRODUCTS

2.01 PATCHING MATERIALS

A. New Materials: As specified in product sections; match existing products and work for patching and extending work.

B. Type and Quality of Existing Products: Determine by inspecting and testing products where necessary, referring to existing work as a standard.

C. Product Substitution: For any proposed change in materials, submit request for substitution described in Section 01 60 00 Product Requirements.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that existing site conditions and substrate surfaces are acceptable for subsequent work.

B. Start of work means acceptance of existing conditions.

C. Verify that existing substrate is capable of structural support or attachment of new work being applied or attached.

D. Examine and verify specific conditions described in individual specification sections.

E. Take field measurements before confirming product orders or beginning fabrication, to minimize waste due to over-ordering or misfabrication.

F. Verify that utility services are available, of the correct characteristics, and in the correct locations.

G. Prior to Cutting: Examine existing conditions prior to commencing work, including elements subject to damage or movement during cutting and patching. After uncovering existing work, assess conditions affecting performance of work. Beginning of cutting or patching means acceptance of existing conditions.

3.02 PREPARATION

A. Clean substrate surfaces prior to applying next material or substance.

B. Seal cracks or openings of substrate prior to applying next material or substance.

C. Apply manufacturer required or recommended substrate primer, sealer, or conditioner prior to applying any new material or substance in contact or bond.

3.03 PREINSTALLATION MEETINGS

A. When required in individual specification sections, convene a preinstallation meeting at the site prior to commencing work of the section.

B. Require attendance of parties directly affecting, or affected by, work of the specific section.

C. Notify Alliance Consulting Engineers, Inc. four (4) days in advance of meeting date.

D. Prepare agenda and preside at meeting:

1. Review conditions of examination, preparation and installation procedures.

2. Review coordination with related work.

E. Record minutes and distribute copies within two (2) days after meeting to participants, with two (2) copies to Alliance Consulting Engineers, Inc., Owners, participants, and those affected by decisions made.

3.04 LAYING OUT THE WORK

A. Verify locations of survey control points prior to starting work.

B. Promptly notify Alliance Consulting Engineers, Inc. of any discrepancies discovered.

C. Protect survey control points prior to starting site work; preserve permanent reference points during construction.

D. Promptly report to Alliance Consulting Engineers, Inc. the loss or destruction of any reference point or relocation required because of changes in grades or other reasons.

E. Replace dislocated survey control points based on original survey control. Make no changes without prior written notice to Alliance Consulting Engineers, Inc.

F. Utilize recognized engineering survey practices.

G. Establish a minimum of two (2) permanent bench marks on site, referenced to established control points. Record locations, with horizontal and vertical data, on project record documents.

H. Establish elevations, lines and levels. Locate and lay out by instrumentation and similar appropriate means:

1. Site improvements including pavements; stakes for grading, fill and topsoil placement; utility locations, slopes, and invert elevations.

2. Grid or axis for structures.

I. Periodically verify layouts by same means.

J. Maintain a complete and accurate log of control and survey work as it progresses.

3.05 GENERAL INSTALLATION REQUIREMENTS

A. Install products as specified in individual sections, in accordance with manufacturer's instructions and recommendations, and so as to avoid waste due to necessity for replacement.

B. Make vertical elements plumb and horizontal elements level, unless otherwise indicated.

C. Install equipment and fittings plumb and level, neatly aligned with adjacent vertical and horizontal lines, unless otherwise indicated.

D. Make consistent texture on surfaces, with seamless transitions, unless otherwise indicated.

E. Make neat transitions between different surfaces, maintaining texture and appearance.

3.06 ALTERATIONS

A. Drawings showing existing construction and utilities are based on casual field observation and existing record documents only.

1. Verify that construction and utility arrangements are as shown.

2. Report discrepancies to Alliance Consulting Engineers, Inc. before disturbing existing installation.

3. Beginning of alterations work constitutes acceptance of existing conditions.

B. Remove existing work as indicated and as required to accomplish new work.

1. Remove items indicated on drawings or described in the Technical Specifications.

2. Relocate items indicated on drawings or described in the Technical Specifications.

C. Services (Including but not limited to Fire Protection, Electrical and Telecommunications): Remove, relocate and extend existing systems to accommodate new construction.

1. Maintain existing active systems that are to remain in operation; maintain access to equipment and operational components; if necessary, modify installation to allow access or provide access panel.

2. Where existing systems or equipment are not active and Contract Documents require reactivation, put back into operational condition; repair supply, distribution, and equipment as required.

3. Where existing active systems serve occupied facilities but are to be replaced with new services, maintain existing systems in service until new systems are complete and ready for service.

a. Disable existing systems only to make switchovers and connections; minimize duration of outages.

b. Provide temporary connections as required to maintain existing systems in service.

4. Verify that abandoned services serve only abandoned facilities.

D. Protect existing work to remain.

1. Prevent movement of structure; provide shoring and bracing if necessary.

2. Perform cutting to accomplish removals neatly and as specified for cutting new work.

3. Repair adjacent construction and finishes damaged during removal work.

4. Patch as specified for patching new work.

E. Adapt existing work to fit new work: Make as neat and smooth transition as possible.

1. When existing finished surfaces are cut so that a smooth transition with new work is not possible, terminate existing surface along a straight line at a natural line of division and make recommendation to Alliance Consulting Engineers, Inc.

F. Patching: Where the existing surface is not indicated to be refinished, patch to match the surface finish that existed prior to cutting. Where the surface is indicated to be refinished, patch so that the substrate is ready for the new finish.

G. Clean existing systems and equipment.

H. Remove demolition debris and abandoned items from alterations areas and dispose of off-site; do not burn or bury.

I. Do not begin new construction in alterations areas before demolition is complete.

J. Comply with all other applicable requirements of this section.

3.07 CUTTING AND PATCHING

A. Whenever possible, execute the work by methods that avoid cutting or patching.

B. See Alterations article above for additional requirements.

1. Complete the work.

2. Fit products together to integrate with other work.

3. Provide openings for penetration of mechanical, electrical and other services.

4. Match work that has been cut to adjacent work.

5. Repair areas adjacent to cuts to required condition.

6. Repair new work damaged by subsequent work.

7. Remove samples of installed work for testing when requested.

8. Remove and replace defective and non-conforming work.

C. Execute cutting and patching including excavation and fill to complete the work, to uncover work in order to install improperly sequenced work, to remove and replace defective or non-conforming work, to remove samples of installed work for testing when requested, to provide openings in the work for penetration of mechanical and electrical work, to execute patching to complement adjacent work, and to fit products together to integrate with other work.

D. Execute work by methods that avoid damage to other work and that will provide appropriate surfaces to receive patching and finishing. In existing work, minimize damage and restore to original condition.

E. Employ original installer to perform cutting for weather exposed and moisture resistant elements, and sight exposed surfaces.

F. Cut rigid materials using masonry saw or core drill. Pneumatic tools not allowed without prior approval.

G. Restore work with new products in accordance with requirements of Contract Documents.

H. Fit work air tight to pipes, sleeves, ducts, conduit, and other penetrations through surfaces.

I. Patching:

1. Finish patched surfaces to match finish that existed prior to patching. On continuous surfaces, refinish to nearest intersection or natural break. For an assembly, refinish entire unit.

2. Match color, texture, and appearance.

3. Repair patched surfaces that are damaged, lifted, discolored, or showing other imperfections due to patching work. If defects are due to condition of substrate, repair substrate prior to repairing finish.

J. Refinish surfaces to match adjacent finish. For continuous surfaces, refinish to nearest intersection or natural break. For an assembly, refinish entire unit.

K. Make neat transitions. Patch work to match adjacent work in texture and appearance. Where new work abuts or aligns with existing, perform a smooth and even transition.

L. Patch or replace surfaces that are damaged, lifted, discolored, or showing other imperfections due to patching work. Repair substrate prior to patching finish. Finish patches to produce uniform finish and texture over entire area. When finish cannot be matched, refinish entire surface to nearest intersections.

3.08 PROGRESS CLEANING

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

B. Collect and remove waste materials, debris, and trash/rubbish from site periodically and dispose off-site; do not burn or bury.

3.09 PROTECTION OF INSTALLED WORK

A. Protect installed work from damage by construction operations.

B. Provide special protection where specified in individual specification sections.

C. Provide temporary and removable protection for installed products. Control activity in immediate work area to prevent damage.

D. Remove protective coverings when no longer needed; reuse or recycle plastic coverings if possible.

3.10 SYSTEM STARTUP

A. Coordinate schedule for start-up of various equipment and systems.

B. Verify that each piece of equipment or system has been checked for proper lubrication, drive rotation, belt tension, control sequence, and for conditions that may cause damage.

C. Verify tests, meter readings, and specified electrical characteristics agree with those required by the equipment or system manufacturer.

D. Verify that wiring and support components for equipment are complete and tested.

E. Execute start-up under supervision of applicable Contractor personnel and manufacturer's representative in accordance with manufacturers' instructions.

F. Submit a written report that equipment or system has been properly installed and is functioning correctly.

3.11 DEMONSTRATION AND INSTRUCTION

A. Demonstrate start-up, operation, control, adjustment, trouble-shooting, servicing, maintenance, and shutdown of each item of equipment at scheduled time, at equipment location.

B. For equipment or systems requiring seasonal operation, perform demonstration for other season within six months.

C. Provide a qualified person who is knowledgeable about the Project to perform demonstration and instruction of owner personnel.

3.12 ADJUSTING

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

3.13 FINAL CLEANING

A. Execute final cleaning prior to final project assessment.

B. Use cleaning materials that are nonhazardous.

C. Clean site; sweep paved areas, rake clean landscaped surfaces.

D. Remove waste, surplus materials, trash/rubbish, and construction facilities from the site; dispose of in legal manner; do not burn or bury.

3.14 PROJECT RECORD DOCUMENTS

A. Work includes:

1. Throughout progress of the Work, maintain an accurate record of changes in the Contract Documents, as described in Article 3.1 below.

2. Upon completion of the Work, deliver the recorded changes to the Engineer.

B. Related work:

1. Documents affecting work of this Section include, but are not necessarily limited to, General Conditions, and Sections in Division 01 of these specifications.

2. Other requirements affecting Project Record Documents may appear in pertinent other Sections of these specifications.

C. Quality assurance:

1. Delegate the responsibility for maintenance of Record Documents to one person on the Contractor's staff as approved by the Engineer.

2. Accuracy of records shall be such that future search for items shown on the Project Record Documents may rely reasonably on the information provided under this Section of the Work.

D. Submittals:

1. The Engineer's approval of the current status of Project Record Documents may be a prerequisite to the Engineer's approval of requests for progress payment and request for final payment under the Contract.

2. Prior to submitting each request for progress payment, secure the Engineer's approval of the current status of the Project Record Documents.

3. Prior to submitting request for final payment, submit the final Project Record Documents to the Engineer and secure his approval.

E. Product handling:

1. Maintain Record Documents completely protected from deterioration and from loss and damage until completion of the Work and transfer to the Engineer.

2. In the event of loss of recorded data, use means necessary to again secure the data to the Engineer's approval.

a. Such means shall include, if necessary in the opinion of the Engineer, removal and replacement of concealing materials.

b. In such case, provide replacements to the standards originally required by the Contract Documents.

F. Job Set Documents:

1. Promptly following receipt of the Owner's Notice to Proceed, secure from the Engineer, at no charge to the Contractor, one complete set of all Documents comprising the Contract.

G. Maintenance of Job Set:

1. Immediately upon receipt of the job set described in above paragraph titled “JOB SET DOCUMENTS”, identify each of the Documents with the title, "RECORD DOCUMENTS - JOB SET".

2. Preservation:

a. Considering the Contract completion time, the probable number of occasions upon which the job set must be taken out for new entries and for examination, and the conditions under which these activities will be performed, devise a suitable method for protecting the job set to the approval of the Engineer.

b. Do not use the job set for any purpose except entry of new data and for review by the Engineer.

c. Maintain the job set at the site of Work as that site is designated by the Engineer.

3. Making entries on Job Set Drawings:

a. Use erasable colored pencil, preferably red (not ink or indelible pencil) to delineate changes.

b. Show by station number location of all fittings, manholes, valves, wye locations, etc.

c. Reference all fittings and valves to two aboveground items reasonably safe from being relocated and indicate such references on the drawings.

d. Show location of electrical conduit, pull boxes, etc.

4. Submittal:

a. Submit "marked-up" set of drawings to the Engineer.

i. Make any necessary additions as required by the Engineer.

3.15 CLOSEOUT PROCEDURES

A. Work included shall be providing compliance with the requirements of the General Conditions of these Specifications for administrative procedures in closing out the project work.

B. Make submittals that are required by governing or other authorities.

1. Provide copies to Alliance Consulting Engineers, Inc.

2. When the Engineer finds the Contractor's work acceptable, the Contractor shall be given such notice and should proceed with closeout submittals.

3. Closeout submittals shall contain at least the following:

a. Project record documents.

b. Equipment operation and maintenance manuals and copies of start-up reports.

c. Warranties and bonds.

d. Spare parts and manuals.

e. Evidence of payment and release to liens per General Conditions.

f. Section 00 65 19.13 - Contractor's Affidavit.

C. Notify Alliance Consulting Engineers, Inc. when work is considered ready for Substantial Completion.

1. The Contractor shall notify the Engineer that, in his opinion, the project is substantially complete. A written statement listing items complete shall be submitted.

2. Upon receipt of the Contractor's notice, the Engineer shall make an observation to determine if substantial completion is provided.

3. If, in the Engineer's opinion, the project is not substantially complete, a written notice to the Contractor shall follow outlining reasons and deficiencies in work that comprised the Engineer's decision. The Engineer's decision shall be final.

D. Request and obtain permit acceptance on all open construction permits.

E. 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 Alliance Consulting Engineers, Inc.'s review.

F. Correct items of work listed in executed Certificates of Substantial Completion

and comply with requirements for access to Owners-occupied areas.

G. Accompany Engineer & Owner on preliminary final observation.

1. The Engineer will make a final observation for the Contractor after all items noted in the substantial completion observation have been corrected. The Contractor shall notify the Engineer in writing when a final observation is needed. Incomplete and/or defective work shall be given to the Contractor by written notice.

H. Notify Alliance Consulting Engineers, Inc. when work is considered finally complete.

I. Complete items of work determined by Alliance Consulting Engineers, Inc.'s final observation.

J. Re-observation:

1. Re-observation required due to failure by the Contractor to make previously noted corrections will be performed by the Engineer.

2. Cost for such observations will be due to and payable by the Contractor at a rate equal to charges to the Owner for similar work.

3. Re-observations will continue until the work is acceptable to the Engineer.

K. Final Payment:

1. Final payment to the Contractor will be made upon completion of the previous items and others required by these specifications. A final statement shall be forwarded to the Engineer. The statement shall address:

a. Previous change orders.

b. Unit prices.

c. Deductions for un-corrected work.

d. Deductions for liquidated damages.

e. Deductions for re-testing work.

f. Deductions for re-observation.

g. Deductions for shop drawing review.

h. Adjusted contract sum.

i. Previous payments.

j. Amount due.

2. When required, the Engineer will prepare a contract change order for adjustments not previously made.

END OF SECTION

SECTION 01 71 23

FIELD ENGINEERING

PART 1 GENERAL

1.01 DESCRIPTION

A. Work included: Provide such field engineering services as are required for proper completion of the Work.

1.02 Related work:

A. Documents affecting work of this Section include, but are not necessarily limited to, General Conditions and Sections in Division 01 of these Specifications.

1.03 QUALITY ASSURANCE

A. Provide competent labor, supervision, inspection services, testing services, materials and equipment for a complete and quality rehabilitation and coating project.

B. Exercise proper precautions to verify the information described in the Technical Specifications and Contract Documents prior to laying out or performing any part of the Work.

1. The Contractor will be held responsible for any errors therein that otherwise might have been avoided.

2. Promptly inform the Engineer of any errors or discrepancies discovered in the Technical Specifications in order that proper corrections may be made.

1.04 PROCEDURES

A. Verify lead content of existing coating system before starting work on the site.

B. Secure all required permits and make all required and necessary notifications before starting work on the site.

C. Perform preparation, coating and repair task during progress of the Work consistent with the spirit of the Technical Specifications.

D. Do not deviate from or change items of the Work without specific approval from the Engineer.

E. Promptly advise the Engineer when a change becomes necessary because of other changes in the Work.

PART 2 PRODUCTS – NOT USED

PART 3 EXECUTION – NOT USED

END OF SECTION

SECTION 01 74 19

WASTE MANAGEMENT

PART 1 GENERAL

1.01 WASTE MANAGEMENT REQUIREMENTS

A. The Owner requires that this Project generate the least amount of trash and waste possible.

B. Employ processes that ensure the generation of as little waste as possible due to error, poor planning, breakage, mishandling, contamination, or other factors.

C. Minimize trash/waste disposal in landfills; reuse, salvage, or recycle as much waste as economically feasible.

D. Methods of trash/waste disposal that are **not** acceptable are:

1. Burning on the project site.

2. Burying on the project site.

3. Other illegal dumping or burying.

E. Regulatory Requirements: Contractor is responsible for knowing and complying with regulatory requirements, including but not limited to Federal, state and local requirements, pertaining to legal disposal of all construction and demolition waste materials.

1.02 DEFINITIONS

A. Clean: Untreated and unpainted; not contaminated with oils, solvents, caulk, or the like.

B. Construction and Demolition Waste: Solid wastes typically including building materials, packaging, trash, debris, and rubble resulting from construction, remodeling, repair and demolition operations.

C. Hazardous: Exhibiting the characteristics of hazardous substances, i.e., ignitibility, corrosivity, toxicity or reactivity.

D. Nonhazardous: Exhibiting none of the characteristics of hazardous substances, i.e., ignitibility, corrosivity, toxicity, or reactivity.

E. Nontoxic: Neither immediately poisonous to humans nor poisonous after a long period of exposure.

F. Recyclable: The ability of a product or material to be recovered at the end of its life cycle and remanufactured into a new product for reuse by others.

G. Recycle: To remove a waste material from the project site to another site for remanufacture into a new product for reuse by others.

H. Recycling: The process of sorting, cleansing, treating and reconstituting solid waste and other discarded materials for the purpose of using the altered form. Recycling does not include burning, incinerating, or thermally destroying waste.

I. Return: To give back reusable items or unused products to vendors for credit.

J. Reuse: To reuse a construction waste material in some manner on the project site.

K. Salvage: To remove a waste material from the project site to another site for resale or reuse by others.

L. Sediment: Soil and other debris that has been eroded and transported by storm or well production run-off water.

M. Source Separation: The act of keeping different types of waste materials separate beginning from the first time they become waste.

N. Toxic: Poisonous to humans either immediately or after a long period of exposure.

O. Trash: Any product or material unable to be reused, returned, recycled, or salvaged.

P. Waste: Extra material or material that has reached the end of its useful life in its intended use. Waste includes salvageable, returnable, recyclable, and reusable material.

1.03 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

PART 2 PRODUCTS

2.01 No products are required under this Section.

A. See Section 01 60 00 - Product Requirements for substitution submission procedures.

B. For each proposed product substitution, submit the following information in addition to requirements specified in Section 01 60 00 Product Requirements:

1. Relative amount of waste produced, compared to specified product.

2. Cost savings on waste disposal, compared to specified product, to be deducted from the Contract Sum.

3. Proposed disposal method for waste product.

4. Markets for recycled waste product.

PART 3 EXECUTION

3.01 WASTE MANAGEMENT PROCEDURES

A. See Section 01 30 00 Administrative Requirements for additional requirements for project meetings, reports, submittal procedures and project documentation.

B. See Section 01 60 00 Product Requirements for waste prevention requirements related to delivery, storage and handling.

C. See Section 01 70 00 Execution Requirements for trash/waste prevention procedures related to demolition, cutting and patching, installation, protection, and cleaning.

3.02 WASTE MANAGEMENT PLAN IMPLEMENTATION

A. Instruction: Provide on-site instruction of appropriate separation, handling, and recycling, salvage, reuse and return methods to be used by all parties at the appropriate stages of the project.

B. Meetings: Discuss trash/waste management goals and issues at project meetings.

1. Pre-bid meeting.

2. Pre-construction meeting.

3. Regular job-site meetings.

C. Reuse of Materials On-Site: Set aside, sort and protect separated products in preparation for reuse.

D. Salvage: Set aside, sort and protect products to be salvaged for reuse off-site.

END OF SECTION

SECTION 01 78 00

CLOSEOUT SUBMITTALS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Project Record Documents.

B. Operation and Maintenance Data.

C. Warranties and Bonds.

1.02 RELATED REQUIREMENTS

A. Section 00 70 00 – Standard General Conditions of the Construction Contract: Performance bond and labor and material payment bonds, warranty, and correction of work.

B. Section 01 30 00 - Administrative Requirements: Submittals procedures, shop drawings, product data, and samples.

C. Section 01 70 00 - Execution Requirements: Contract closeout procedures.

D. Individual Product Sections: Specific requirements for operation and maintenance data.

E. Individual Product Sections: Warranties required for specific products or Work.

1.03 SUBMITTALS

A. Project Record Documents: Contractor to keep Record Documents on site at all times for review by Engineer or Owner. Submit documents to Alliance Consulting Engineers, Inc. with claim for final Application for Payment.

B. Operation and Maintenance Data:

1. Submit two copies of preliminary draft or proposed formats and outlines of contents before start of Work. Alliance Consulting Engineers, Inc. will review draft and return one copy with comments.

2. For equipment, or component parts of equipment put into service during construction and operated by the Owners, submit completed documents within ten days after acceptance.

3. Submit one copy of completed documents 15 days prior to final inspection. This copy will be reviewed and returned after final inspection, with Alliance Consulting Engineers, Inc. comments. Revise content of all document sets as required prior to final submission.

4. Submit two sets of revised final documents in final form within 10 days after final inspection.

C. Warranties and Bonds:

1. For equipment or component parts of equipment put into service during construction with the Owners permission, submit documents within 10 days after acceptance.

2. Make other submittals within 10 days after Date of Substantial Completion, prior to final Application for Payment.

3. For items of Work for which acceptance is delayed beyond Date of Substantial Completion, submit within 10 days after acceptance, listing the date of acceptance as the beginning of the warranty period.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 PROJECT RECORD DOCUMENTS

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

1. Drawings.

2. Addenda.

3. Change Orders and other modifications to the Contract.

B. Ensure entries are complete and accurate, enabling future reference by the Owner.

C. Store record documents separate from documents used for construction.

D. Record information concurrent with construction progress.

E. Record Drawings: Legibly mark each item to record actual construction including:

1. Field changes of dimension and detail.

2. Details not on original Contract drawings.

3.02 OPERATION AND MAINTENANCE DATA

A. For Each Product or System: List names, addresses and telephone numbers of Subcontractors and suppliers, including local source of supplies and replacement parts.

B. Product Data: Mark each sheet to clearly identify specific products and component parts, and data applicable to installation. Delete inapplicable information.

C. Drawings: Supplement product data to illustrate relations of component parts of equipment and systems, to show control and flow diagrams. Do not use Project Record Documents as maintenance drawings.

D. Typed Text: As required to supplement product data. Provide logical sequence of instructions for each procedure, incorporating manufacturer's instructions.

3.03 OPERATION AND MAINTENANCE MANUALS

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

B. Prepare data in the form of an instructional manual.

3.04 WARRANTIES AND BONDS

A. Obtain warranties and bonds, executed in duplicate by responsible Subcontractors, suppliers, and manufacturers, within 10 days after completion of the applicable item of work. Except for items put into use with The Owners permission, leave date of beginning of time of warranty until the Date of Substantial completion is determined.

B. Verify that documents are in proper form, contain full information, and are notarized.

C. Co-execute submittals when required.

D. Retain warranties and bonds until time specified for submittal.

END OF SECTION

SECTION 02 32 13

GEOTECHNICAL DATA, SUBSURFACE DRILLING AND SAMPLING

PART 1 GENERAL

1.01 DESCRIPTION

A. Soils Evaluations Reports: These Geotechnical Reports have been prepared and are detailed in the Geotechnical Data provided in Section 02 32 13.1.

B. Use of Data: This report was obtained only for the Engineer's use in design and is not a part of the Contract Documents.

C. The report is available for bidders' information, but is not a warranty of subsurface conditions.

D. It is the responsibility of the Bidders to visit the site and acquaint themselves with the existing conditions.

E. Prior to bidding, bidders may make their own Subsurface Evaluations to satisfy themselves as to site and subsurface soil conditions, but these investigations must be performed under the time schedules and arrangements that have been approved in advance by the Engineer.

1.02 QUALITY ASSURANCE

A. All work that is performed under this contract that does not meet technical or design requirements must be adjusted and no deviation from the Contract Documents can be made without specific and written approval from the Engineer.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 02 32 13.1

GEOTECHNICAL DATA – GEOTECHNICAL EXPLORATION REPORTS
FOR
THE CITY OF NEWBERRY RECREATIONAL COMPLEX ON
APPROXIMATELY 200-ACRES ALONG SC HIGHWAY 34
FOR THE CITY OF NEWBERRY
IN
NEWBERRY COUNTY, SOUTH CAROLINA

PROJECT NO. 17125-0036
NOVEMBER 2017

1.0 Subsurface and Physical Conditions, including Geotechnical Data, were collected during the preparation of the contract documents. Those reports of explorations and tests of subsurface conditions at or contiguous to the Site, that the Engineer has used in preparing the Bidding Documents including and attached to this section, are as follows:

1. Report dated October 26, 2017, prepared by S&ME, Inc., Columbia, South Carolina, entitled: "Report of Geotechnical Exploration – City of Newberry Recreation Complex, Newberry, South Carolina; S&ME Project No. 1461-17-025.

END OF SECTION

REPORT OF GEOTECHNICAL EXPLORATION
City of Newberry Recreation Complex
Newberry, South Carolina
S&ME Project No. 1461-17-025

Prepared for:
Alliance Consulting Engineers
P.O. Box 8147
Columbia, South Carolina 29202-8147

Prepared by:
S&ME, Inc.
134 Suber Road
Columbia, South Carolina 29210

October 26, 2017

October 26, 2017

Alliance Consulting Engineers
P.O. Box 8147
Columbia, South Carolina 29202-8147

Attention: Mr. Steve Whaley, P.E., LEED Green Associate, Project Manager

Reference: **REPORT OF GEOTECHNICAL EXPLORATION**
City of Newberry Recreation Complex
Dixie Drive and Glenn Street Extension
Newberry, South Carolina 29108
S&ME Project No. 1461-17-025

Dear Mr. Whaley:

As requested, S&ME, Inc. has completed field and laboratory testing for the City of Newberry Recreation Complex site, in Newberry, South Carolina. Our work was performed in general accordance with our proposal No. 14-1700178, dated March 13, 2017.

This report provides information on the exploration and testing procedures used, our boring records, our laboratory test results, and our conclusions and recommendations regarding site conditions, site preparation, suitability of on-site soils for use as structural fill, fill placement and compaction, foundation type, foundation design values, estimated settlements, slab-on-grade design values and flexible pavement design values and recommended thickness.

S&ME appreciates this opportunity to work with you as your geotechnical engineering consultant on this project. Please contact us at (803) 561-9024 if you have any questions or need any additional information regarding this report.

Sincerely,

S&ME, Inc.

SOUTH CAROLINA
S&ME, INC.
No. C00473
CERTIFICATE OF AUTHORIZATION

Hunter G. McKenzie, E.I.T.
Geotechnical Staff Professional

SOUTH CAROLINA
LICENSED PROFESSIONAL ENGINEER
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10-26-17
ROBERT C. BRUORTON

Robert C. Bruorton, P.E.
Senior Engineer/Project Manager

Table of Contents

Appendices

1.0 Project Information

Information that we have concerning the subject site was initially provided by Mr. Steve Whaley, P.E. with Alliance Consulting Engineers, Inc. to Mr. Chad Bruorton, P.E. of S&ME via e-mail on March 10, 2017. Information included a *Conceptual Site Plan* for the development, dated December 15, 2015.

The site is approximately 215 acres in area and is located near the intersection of Dixie Drive and Glenn Street Extension, in Newberry, South Carolina, as shown on the *Site Location Plan*, Figure 1 ion Appendix I. The site fronts Dixie Drive for roughly 1,000 linear feet within the northern portion of the site, is bordered by railroad tracts along the eastern boundary, and fronts Glenn Street Extension for roughly 700 linear feet within the southwestern portion of the site. The site is currently mostly wooded with existing power line right-of-ways along the southern and eastern portions of the site and an existing pond located within the north-central portion of the site.

From our review of the provided information, it is understood that the planned development at the site will be developed in phases, with Phase 1 only being explored at this time. Phase 1 of the development will consist of a new recreation complex that will consist of the following:

- A four-field baseball complex with a press-box,
- Soccer/Multi-purpose fields,
- A playground,
- A splash pad,
- A restroom/press-box building,
- Two parking lots, and
- Roughly 1 mile of ingress/egress roadway that will extend from Dixie Drive to Glenn Street Extension.

The press-box structure is to be two-stories in height and the restroom one-story in height and both be constructed of reinforced masonry walls with structural steel deck and roof systems. The buildings are planned to be supported by a shallow foundation system and a cast-in-place concrete slab-on-grade. Maximum wall loads were not provided at the time of this report, therefore, we have assumed roughly 3 to 5 kips per linear foot, typical to structures of this kind.

The playground and splash pad structures are assumed to be constructed of timber and steel framing and are planned to also be supported by a shallow foundation system with cast-in-place concrete slab-on-grades in the splash pad area. Maximum column loads were not available at the time of this report.

Based on our review of on-line aerial and topographic imagery, it appears that existing grades across the site range from roughly 580 to 500 feet, equaling roughly 80 feet of relief. Therefore, we have assumed that cuts and fills may be on the order of 10 to 20 feet to level the development areas.

On October 16, 2017, Mr. Whaley provided an updated site plan to S&ME depicting a revised site layout with proposed grades. The updated plan showed multiple revisions to the proposed Phase 1 development. It is important to note that the soil borings performed by S&ME were in accordance with

the *Conceptual Site Plan* dated December 15, 2015 but are shown in the Boring Location Plan of this report on the updated site plan.

Additional information regarding traffic loading was provided on October 24, 2017, when Mr. Bruorton spoke with Mr. Kyle Clampitt, P.E. of Alliance Consulting Engineers regarding anticipated traffic volumes for the main access road and associated parking lots. Mr. Clampitt explained that anticipated traffic volumes were to be on the order of 500 passenger vehicles per day during weekdays, and 2,000 passenger vehicles per day on weekends, to account for future phases of the development.

2.0 Exploration Procedures

The subsurface exploration of this project included 12 Standard Penetration Test (SPT) soil borings and one 30 to 50 pound bulk sample representing subgrade soils within the pavement areas. The approximate locations of each of the borings are shown in the *Boring Location Plan* attached as Figure 2 in Appendix I.

2.1 Reconnaissance of Project Area

On March 21, 2017, a representative from S&ME visited the site to observe current site conditions and lay out the proposed soil test boring locations. S&ME returned to the site between March 28 and 29, 2017 to complete the layout of the borings once clearing activities began. Soil test boring locations were marked in the field with orange pin flags, while access pathways for clearing were marked with orange flagging tape. Soil test boring locations were laid out using our sub-meter GPS equipment. The boring locations indicated on the attached *Boring Location Plan* must be considered as approximate. No formal survey of boring locations or elevations was conducted by S&ME.

2.2 Field Testing and Sampling

2.2.1 Site Clearing

Since the majority of the site was wooded, pathways were marked with flagging tape and a subcontract timber grinder was dispatched to the site on March 28 and 29, 2017 to clear drill rig access pathways to the boring locations. Trails of approximately 12 to 15 feet wide were cleared with trees chipped in-place. No attempt was made to stack or remove downed trees from the site. Care was taken to limit site disturbance during this process.

2.2.2 Soil Test Borings

Twelve soil test borings with SPT sampling and testing were performed on March 28 and 29, 2017. The SPT soil test borings were performed using a track-mounted, Diedrich D-50 drill rig. The borings were advanced using 3¼-inch inside diameter hollow-stem augers to termination depths ranging from roughly 5 to 15 feet below the existing ground surface.

As previously mentioned, soil borings were performed in accordance with the original site plan, labeled *Conceptual Site Plan,* dated December 15, 2015. It is important to note that the revised site plan provided

on October 16, 2017, depicts locations of specific developments and grades that vary significantly from the original site plan.

Split-spoon samples and Standard Penetration Test Resistance N-values were obtained at selected intervals in general accordance with ASTM D-1586. Representative samples of the soils obtained by the split-spoon sampler were collected and placed in suitably identified, sealed glass jars and transported to our laboratory.

Ground water measurements were attempted in the borings shortly after drilling was completed and were left open overnight to obtain a 24 hour ground water reading. The boreholes were backfilled after completion of ground water measurements with auger cuttings and a plastic hole plug where borings exceeded five feet in depth. A summary of our exploration procedures is included in Appendix II.

2.2.3 Bulk Sampling

One composite bulk sample (BS-1) was obtained from representative pavement subgrade soils from Borings B-8 through B-12. The composite bulk sample of near-surface soils was obtained by randomly taking shovel loads from the cuttings or spoil brought to the surface, until a sample of 30 to 50 lbs. was obtained. The sample was placed in plastic buckets and marked with appropriate descriptive information. A summary of our sampling procedures is included in Appendix II.

2.3 Laboratory Testing

Recovered split-spoon and bulk samples and field logs were transported to our laboratory. Soils were subsequently classified by a geotechnical professional in general accordance with the visual-manual method described in ASTM D2488 *Standard Practice for Description and Identification of Soils (Visual-Manual Method)*.

Laboratory testing was conducted on the bulk sample taken from planned pavement areas, as previously discussed. Laboratory testing included the following:

Table 2-1 – Bulk Sample Laboratory Testing Summary

Test Type	Specification	Quantity
Natural Moisture Content	ASTM D-2216	1
Sieve Analysis	ASTM D-422	1
Atterberg Limits	ASTM D-4318	1
Standard Proctor	ASTM D-698	1
California Bearing Ratio (CBR)	ASTM D-1883	1

A summary of our laboratory testing procedures and the laboratory test results are included in Appendix III.

3.0 Site Conditions

S&ME's assessment of the geotechnical conditions began with a reconnaissance of the topography and physical features of the site. We also consulted various available topographic and geologic maps for relevant information.

3.1 Surface Conditions

The site is located southwest of the intersection of Dixie Drive and Glenn Street Extension in Newberry, South Carolina. The site currently consists of a gated, undeveloped plot of land that is moderately to heavily wooded throughout the site. Existing powerline easements were observed within the southern and eastern portions of the site. Various hunting trails were noted near the central portion of the site that extend from the northern gate to the southern powerline easement. Ponds were noted in the central and western portions of the site. The site is bordered by Dixie Drive to the north, an existing railroad line to the east, wooded areas and existing powerline easements to the south, and residential homes and Glenn Street Extension to the west.

Based on our review of on-line aerial and topographic imagery, existing grades on site ranges from 500 feet to 580 feet, generally sloping from south to north. Surface runoff appears to infiltrate or sheet flow towards the existing ponds observed on site and eventually drain to the north to an unnamed tributary of Bush River. Topographic information was obtained from the USGS Newberry East Topographic Quadrangle map.

3.2 Subsurface Conditions

Recovered field samples and field boring logs were reviewed in the laboratory by a member of our geotechnical staff. Soil test boring records and other field data are assembled in Appendix II.

3.2.1 Site Geology

The site lies within the Piedmont Physiographic Province of South Carolina, an area underlain by soils weathered in place from the parent crystalline bedrock material. Residual soils of the Carolina Piedmont consist of stiff or very stiff micaceous silts and clays, grading to firm sands with depth. These soils have been completely weathered in place from the parent bedrock material, but below depths of a few feet retain most of the relict rock structure. Soil strength derives largely from relict intermolecular bonding and remolded materials generally less exhibit lower shear strength than do undisturbed samples. Piedmont soils are normally consolidated to slightly overconsolidated.

3.2.2 Interpreted Subsurface Profile

The generalized subsurface conditions at the site are described below. The discussed subsurface description is of a generalized nature to highlight the major subsurface stratification features and material characteristics. The boring records included in Appendix II should be reviewed for specific information at each boring location. The depth and thickness of the subsurface strata indicated on the boring records was estimated based on the drill cuttings and the samples recovered. The transition between materials may be more gradual than indicated on the boring records. Information on actual subsurface conditions exists only at the specific boring locations and is relevant to the time the exploration was performed.

Variations may occur and should be expected at locations remote from the boring. The stratification lines were used for our analytical purposes and, unless specifically stated otherwise, should not be used as the basis for design or construction cost estimates. Soil test boring records are attached in Appendix II.

Surface Materials

Surface materials in the form of organic laden topsoil were encountered in Borings B-1 through B-4 and B-7 through B-12, measuring roughly ½ to 7 inches in thickness. Surface materials were not encountered in Borings B-5 and B-6. It is important to note that some stripping of the surface topsoil may have occurred during clearing activities and that topsoil thickness will vary across the site.

Piedmont Residuum

Beneath the surface materials, where encountered, and from the existing ground surface otherwise, borings within the site encountered Piedmont residual soils to the termination depths. The residual soils penetrated by the borings generally consisted of intermittent layers of sands with varying amounts of fines (SC and SM) and low to high plasticity, fine grained soils with varying amounts of sands (CL, CH and ML). These soils will form the immediate bearing surface for the proposed pavements, shallow foundations, and grade slabs and will make up cut soils assumed to be planned for re-use as structural fill soils.

Recovered samples of residual soils were generally red, tan, brown, gray, olive, white and black in color and were generally moist to the touch. SPT N-values ranged from 6 to 48 blows per foot (bpf), indicating loose to dense relative densities in the sandy soils and firm to very stiff relative consistencies in the silty and clayey soils.

Ground Water

Ground water was measured both at the time of boring (TOB) and after a stabilization period of 24 hours. At TOB, ground water was encountered in Boring B-4 exclusively, at a depth of roughly 7 feet below the existing ground surface. After 24 hours, ground water was encountered in Boring B-5 exclusively, at a depth of roughly 7 feet below the existing ground surface, while borehole cave-in was observed in Boring B-4 at this time at roughly 6 feet below the existing ground surface. Ground water was not encountered within the remaining borings at the time of drilling or after 24 hours.

It appears that ground water will not likely impact construction at the site. However, it is important to note that due to the varying location and depth of the silty and clayey soils at the site, perched ground water conditions are possible. Perched ground water is surface water that infiltrates less dense or more permeable soils and becomes trapped or perched on underlying more dense or less permeable soils, such as silts and clays. We note that ground water levels are influenced by precipitation, long term climatic variations, and nearby construction. Measurements of ground water made at different times than our exploration may indicate ground water levels substantially different than indicated on the boring records in Appendix II.

4.0 Conclusions & Recommendations

The following paragraphs include our conclusions and recommendations regarding site preparation, suitability of on-site soils for use as structural fill, fill placement and compaction, foundation type, foundation design values, estimated settlements, slab-on-grade design values, and flexible pavement design values and recommended thickness.

The soil profile encountered at this site would appear generally suitable for the proposed development. It is important to note that some cut portions of the site may encounter excavation that is slightly more difficult, even though partially weathered rock was not encountered.

4.1 Site Preparation

Site preparation should include removal of all unsuitable surface materials within the building footprint and pavement areas. This should include, surface debris, surface vegetation and any organic laden topsoil, stumps, root bulbs, as well as any unstable surface or subsurface soils.

4.1.1 Stripping

The site is wooded with a moderately thick topsoil surface layer in most areas. The organic soil stripping process may expose deeper organic soils in portions of the site than suggested by the boring data. These soils often have a similar color to topsoil, but contain only minor amounts of organics. The organic content of the topsoil materials encountered at the existing ground surface was not tested, therefore, the depth of initial stripping is not known at this time, and could vary, depending on the actual organic content of the soils and the project specifications. If these soils are to remain in-place or are to be re-used as structural fill, the organic content should be tested, in general accordance with ASTM D-2974. If these materials are to be stripped during site preparation, it appears initial stripping would extend to a depth of up to roughly 6 to 8 inches.

4.1.2 Surface Preparation/Proofrolling

After removal of topsoil, unsuitable soils, and surface debris and vegetation and cutting to grade, but prior to fill placement, the remaining exposed ground surface should be observed by the geotechnical engineer or a representative of the geotechnical engineer to confirm that poor soils have been removed and that the exposed subgrade is suitable for support of slabs and pavements.

To aid in evaluation of the exposed soils, the area should be proofrolled using a loaded dump truck or similarly loaded piece of equipment. Areas that rut, pump, or move excessively under movement of the equipment should be undercut to firm materials prior to placement of new fill soil, concrete, or base course stone. If left in place, soft or wet soils will exhibit substantially lower bearing for foundations and pavements.

Care should be taken during construction so that the subgrade soils are not disturbed any more than necessary. If heavily reworked or disturbed, stabilization may be required for what could otherwise be considered an acceptable subgrade.

4.2 Excavation Considerations

Piedmont residuum consisting of loose to medium dense sands or firm to very stiff clays/silts can typically be excavated using pans, scrapers, backhoes and front end loaders in mass grading. The degree of difficulty that mobile equipment will encounter rises dramatically in materials exceeding about 70 to 80 blows per foot. These conditions were not encountered in our soil borings, however, dense sands were encountered in multiple borings (up to 48 bpf in Boring B-7). Due to our understanding of the planned grades for the site and the depth of the dense materials encountered, difficult excavation does not appear to be likely.

4.3 General Comments on Slope Stability and Construction

Due to the existing grades and preliminary finished grades assumed to be planned to level the planned development, it is assumed that cuts and fills may be on the order of 10 to 20 feet in some development areas.

4.3.1 Temporary Excavation Stability

All excavations shall be sloped or shored in accordance with local, state, and federal regulations, including OSHA (29 CFR Part 1926) excavation trench safety standards. The contractor is usually solely responsible for site safety. This information is provided only as a service, and under no circumstances shall S&ME be assumed to be responsible for construction site safety.

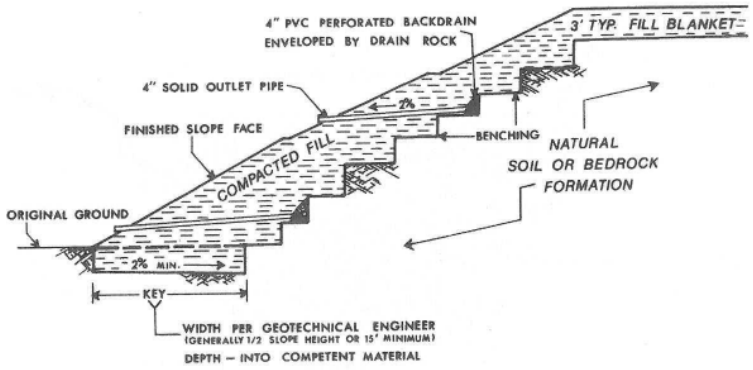
4.3.2 Excavation Slopes

The planned excavations at the site will be advanced through mostly residual sandy and clayey soils. Slope stability analysis is outside of our current scope of work; however, based upon our experience and information obtained by borings at the site, we recommend the excavated cut slopes not exceed a maximum inclination of 2H:1V (horizontal:vertical). These values are for planning purposes and will need to be confirmed during construction by direct observation of the excavated slopes, and inclinations modified, if necessary, based on the observed conditions. If these slopes are to be exceeded, then temporary/permanent retainage may be necessary.

4.3.3 Fill Slopes

Slope stability analysis is outside of our current scope of work; however, based upon our experience, permanent compacted fill slopes with inclinations of 2H:1V (horizontal:vertical) are generally considered stable if properly constructed.

To ensure stability, any loose material should be removed (undercut) from the toe of the proposed fill slope or compacted as indicated in this report prior to placing new fill. The fill slopes should be benched into existing sloping terrain and adequately compacted. The tops and bases of all slopes should be located a minimum of 3 times the height of the slope from structural limits. Furthermore, we recommend that fill slopes constructed along existing slopes or embankments steeper than 4H:1V have a keyway constructed along the slope base to help counteract sliding failure, as shown in the example detail below. The keyway width should be at least ½ of the planned slope height, and the keyway should be embedded a minimum of 2 feet into stiff to medium dense soils.



Benching and Keyway for Fill Slopes constructed along Existing Slopes

We recommend that compacted fill slopes be benched and slightly over-built, (in order to minimize the presence of a loose zone of poorly compacted soils near the slope face), and then cut back to firm, well compacted soils prior to the placement of structure or vegetative cover. Upon construction of a competent slope face, the slope face should be protected from erosion.

4.3.4 General Slope Recommendations

Recommended slopes are preliminary and assume that ground water is controlled at the lowest level of the excavation continuously while the excavation is open. Ground water should not be permitted to flow or emerge from soil excavation slopes. Surface water should be captured by appropriate drainage measures above the slope crest and not allowed to drain down the slope. If perched groundwater is observed emerging from the face of the slope or if surface water is adversely affecting the slope, S&ME should be contacted immediately.

Cut slope profiles should be made relatively uniform such that local slopes do not significantly exceed the recommended slopes. Finally, the recommended slope inclination requires that slopes are monitored for indications of instability and that slopes are flattened or other measures taken if appropriate. Monitoring of the slopes during construction is presently not part of our contracted scope of services for this project.

Stability can be reduced by a number of additional factors including excessive erosion, non-uniform sloping resulting in areas of steeper grades, loose seams in the cut face, and/or ground water emerging from the cut slopes. As a result, proper channeling of surface water is critical. Surface runoff shall be directed away from the slopes via the use of berms, swales, or slope drains. For erosion protection, a protective cover of grass should be established on permanent soil slopes as soon as possible after slope construction. If loose seams are encountered within cut faces during excavation or ground water is encountered, an in-depth analysis of slope stability should be performed.

We caution against the installation of drop inlets or storm sewer lines within an improper embedment zone of the slope face, where possible over stressing and leakage may create maintenance problems or possible isolated slope failure. In general these structures need to be installed a minimum distance of 1½ times the height of the embankment, as measured from the crest and/or toe of the slope. Furthermore, proper embedment of buried utilities beneath slope faces should be established prior to construction, with a minimum embedment for foundation recommended to be 5 feet below the down gradient portion

of the slope, while a minimum embedment for buried utilities is recommended to be 3 feet below the down gradient portion of the slope. These minimum dimensions are to help protect against sliding of the structures within the slope face.

4.4 Fill Placement and Compaction

Before beginning to place fill, sample and test each proposed fill material to determine maximum dry density, optimum moisture content, natural moisture content, gradation and plasticity of the soil. Structural fill material should have less than 5 percent organic matter, a standard Proctor maximum dry density of 100 pcf or greater and a plasticity index (PI) of 30 percent or less. We recommend that any off-site borrow meet the organic content, PI and density requirements of this section. Testing will be required before fill placement begins to determine the optimum moisture-density condition for the fill materials. All material to be used as soil fill should be tested and approved by the geotechnical engineer before being placed.

The existing near-surface sandy Piedmont Residuum appears suitable while the existing near-surface clayey and silty Piedmont Residuum appears marginally suitable for use as compacted fill based on visual examination; however, classification, moisture content and compaction tests should be performed to verify this assessment.

The high plasticity soils, such as the fat clays (CH) encountered in Boring B-10, are considered unsuitable for re-use as structural fill.

It is important to note that the on-site soils, specifically the cohesive residual soils, are moisture sensitive and can be difficult to work. These difficulties can include softening of exposed subgrade soils, excessive rutting or deflection under construction traffic, and the difficulty associated with adequately drying and compacting wet soil. Moisture-related earthwork difficulties can be reduced by performing the earthwork during the typically drier months of the year (May through October).

4.4.1 Density and Moisture Requirements

Place new fill in maximum 8-inch loose lifts and compact to at least 95 percent in mass graded and structural areas and at least 98 percent within the upper 3 feet of pavement subgrade areas of maximum dry density (ASTM D-698 Standard Proctor). Fill moisture content should be maintained within +/- 3 percent of the optimum moisture content. Contractor should be prepared to wet or dry soils as necessary to achieve compaction. Fill should be placed level at least 10 feet beyond building footprint and 5 feet beyond pavement footprints before sloping. In addition to meeting the compaction requirement, fill material must be stable under movement of the construction equipment and must not exhibit rutting or pumping after compacting.

4.4.2 Compaction of Coarse-Grained Soils

A vibratory sheeps-foot roller will likely be effective for compaction of the clayey and silty sandy (SC and SM) soils encountered at the site. Sheeps-foot compactors will likely be preferable because the pads better penetrate the soil and they tend to break down the natural cohesive bonds between the particles.

Sandy soils excavated above the water table are usually close enough to optimum moisture content to place and compact efficiently. Soils that are initially too wet or are allowed to become wet due to rainfall are more difficult to use.

4.4.3 Compaction of Fine-Grained Soils

The compaction characteristics of fine grained soils with plastic properties (CL, ML and CH), will be highly dependent on the soil moisture content at the time of construction. Sheeps-foot compactors will likely be preferable because the pads better penetrate the soil and they tend to break down the natural cohesive bonds between the particles. Pneumatic tire compactors can also be used but will likely be better suited only where the soils have a low to medium plasticity index.

The water content of these soils is usually very difficult to modify in the field. Above or below the optimum moisture content, the soils become progressively more difficult to manipulate and compact. Soils excavated above the water table are usually close enough to optimum moisture content to place and compact efficiently. Soils that are initially too wet or are allowed to become wet due to rainfall are more difficult to use. Drying wet clayey and silty soils usually requires favorable weather conditions and often requires repeated disking and rolling with sheeps-foot rollers to lower the moisture content.

Slope the fill surface to drain and prevent ponding water. If rain is expected while filling is temporarily halted, roll the surface with rubber tire or steel drum equipment to improve surface run-off.

4.4.4 Deep Fill Considerations

Based on the information provided, fills upwards of 20 feet in depth are planned to be placed at the site. Soils when subject to load may deflect, consolidate, or densify. Surcharge loading induced by these heights of fills will induce substantial compression of the underlying soils. The placed fill itself will also undergo significant volume change due to self-weight.

Based on previous experience with high fills in the Piedmont, consolidation of the fill under self-weight will mostly occur while the fill is being placed. Filled soils will lie above the water table. They will be only partially saturated. Primary consolidation will for that reason be very rapid and impossible to tell apart from immediate settlement. A small amount of additional settlement or creep will occur shortly after topping out the fill. Secondary compression will be very small and are usually neglected in settlement estimates.

Residual soils in-place consisting of silts and clays (fine grained, cohesive) exhibit consolidation behavior which is dependent on stress history, mineralogy, age, moisture content, and geologic formation. The time rate of consolidation of silt and clay materials is greatly dependent on particle sizes of the soil and drainage paths. Above the water table consolidation occurs mostly as immediate settlement. Thick deposits of high clay content materials may take years to consolidate, even under high stress. Soils with significant silt content, or free drainage conditions (such as sand seams), may consolidate relatively rapidly.

Depending on the settlement tolerances of structures and pavements in deep fill areas, settlement monitoring may be necessary. If necessary, we recommend settlement monitoring points be placed at

various locations where fill thickness is in excess of 20 feet. Monitoring would include installation of settlement plates and hubs.

4.4.5 Monitoring and Testing

Fill placement should be witnessed by an experienced soils technician working under the guidance of the geotechnical engineer. We recommend full time observation by a qualified soils technician with testing at random intervals to confirm compaction is being achieved.

4.4.6 Wet Weather Grading

Based on our experience, cohesive soils similar to those encountered at the site can be difficult to work if allowed to become wet and may also require extended drying times. The grading contractor should take measures so that periodic rain does not significantly affect grading. This includes diverting rainwater runoff away from the construction area and sealing the ground surface with a smooth drum roller to help prevent rainwater from migrating below the surface soils.

Our experience indicates that allowing heavy equipment to run on the existing ground surface will result in heavy rutting. Running heavy equipment on previously placed fill during rain events or where water is ponded will result in degradation of the fill. If these conditions are evident or persist and routinely cause issues, then during construction, gravity-drained surface ditches should be installed around the site to promote surface runoff. Ditches should have at least 6 inches of relief per 100 feet of length to facilitate flow.

4.5 Foundation Design and Construction

Based on our boring data and experience in the area, assuming the site preparation recommendations provided above have been followed, shallow foundations appear suitable for support of the proposed structures. We understand that shallow foundation systems consisting of typical continuous wall footings for the press-box and restroom structures will be implemented for this project. We estimated bearing capacities for typical wall dimensions using our boring data and our experience with similar soils under similar loading conditions. Estimated ultimate bearing capacity exceeds recommended allowable bearing pressures by a safety factor of at least 3 on level ground, provided that footings are designed and constructed as outlined in this report. The following represents our geotechnical recommendations regarding structural support.

4.5.1 Allowable Bearing Pressure

Assuming proper design and construction of the proposed footings, a net bearing pressure of 2,500 pounds per square foot (psf) or less is recommended for continuous wall footings bearing on residual or modified soils similar to those encountered in our borings or well-compacted fill soils placed and compacted as recommended in previous sections of this report.

Excavated footings should be examined by the geotechnical engineer or representative of the geotechnical engineer prior to placement of concrete to determine that variations in the soil do not lower the allowable bearing capacity. It may be necessary to redesign footings in the field (e.g. widen or deepen footings) based on observed conditions.

4.5.2 Bearing Depth and Dimension

Minimum wall footing widths should be at least 12 inches. All footings should have a minimum embedment depth of 12 inches below final grade. This recommendation is made to help prevent a "localized" or "punching" shear failure condition that could exist with very narrow footings.

4.5.3 Settlement

We estimated compression of the bearing soils under the assume applied wall loads, assuming the Westergaard distribution of stresses below the center and at the corners of an infinitely flexible surface load, and then averaging estimated settlements to account for the effect of rigidity of a reinforced footing. Soil compression under imposed loads was estimated based on boring and laboratory data and our experience with similar soils.

From our computations utilizing the assumed loading conditions presented in this report, total anticipated settlement for properly constructed footings will be one inch or less for a typical 2 foot wide wall footing and 2,500 psf allowable bearing pressure. Differential settlement between adjacent footings carrying similar loads is estimated as one half of the total settlement or one-half inch or less.

It is important to note that settlements provided above do not include compression of the native soils by the surcharge weight of new fills placed to achieve proposed grades, nor do they include consolidation of the fill itself due to fill self-weight.

4.5.4 Settlement Time Rate

We estimated time rate of settlement using our general experience in similar soils in the Piedmont region. A large portion of soil compression will occur elastically upon placement of fill or building loads. Since the soils loaded by the footings lie above the water table, time for primary consolidation to occur is likewise very short and settlements associated with secondary compression are negligible. We estimate that approximately 90 percent of total settlements estimated above will occur with load placement. Remaining settlements are expected to largely occur within the next 5 to 7 days.

4.5.5 Foundation Lateral Capacity

Lateral capacity of footings includes a soil lateral pressure and coefficient of friction as described in IBC Section 1806. Where bearing in natural soils, footings will be embedded in material mostly similar to those described as Class 4 in Table 1806.2. Where footings are cast neat against the sides of excavations in natural soils, an allowable lateral bearing pressure of 150 psf per foot depth below natural grade may be used in computations.

A coefficient of friction of 0.25 multiplied by the dead load may be used to calculate lateral sliding resistance. An increase of one-third in the allowable lateral capacity may be considered for load combinations, including wind or earthquake, unless otherwise restricted by design code provisions.

4.5.6 Construction and Observation of Footings

When possible, concrete should be placed the same day footings are excavated to the planned bearing elevations. Remove soils softened by water intrusion or exposure before placing concrete. The

geotechnical engineer or a representative of the geotechnical engineer should observe cleaned footing excavations prior to concrete placement. S&ME should also observe undercut areas prior to backfilling to confirm that poor soils have been removed and that the exposed subgrade is suitable for support of footings. Footings designed for a bearing pressure of 2,500 psf which are required to be undercut below the design bearing elevation should be backfilled with an open-graded stone such as No. 57 stone, flowable fill or well compacted soil fill. If an open-graded stone is used, the stone should be tamped into place.

4.6 Grade Slab Support and Construction

After site preparation and fill placement operations are completed to achieve subgrade elevation for the building pad, the exposed surface should be proofrolled under the observation of the geotechnical engineer with a heavily loaded dump truck or pan. Areas of rutting or pumping soils may require selective undercutting or further stabilization prior to placement of the slab.

Construction of footings or utility lines within the building footprint frequently results in disturbance of the compacted soil subgrade supporting the floor slab. The presence of loosened or disturbed materials on the subgrade when the base stone is placed will have an adverse effect on future floor slab performance, even if compaction data obtained during initial soil placement indicated satisfactory compaction at that time.

The stable residual soils encountered in the upper strata of our borings or well-compacted fill will provide adequate support to proposed soil-supported grade slabs, assuming preparation and compaction of the subgrade as recommended. A modulus of subgrade reaction (k) of 150 psi/in may be used for reinforcing design, assuming a subgrade consisting of compacted soils without segregation by composition. This value is based on published correlations between the type and condition of the fill to be placed at this site and small-diameter plate load tests. The modulus value is considered appropriate for point loads and small-diameter wheel loads, but must be modified (reduced) for wide area loads.

Provide joints in slabs around columns and along wall footings to accommodate minor differential settlements. If moisture sensitive floor coverings are to be used, a vapor barrier should also be included in the floor slab design. The design of the vapor barrier should be in accordance with American Concrete Institute (ACI) guidelines.

4.7 Pavement Thickness and Construction

One three-point soaked laboratory California Bearing Ratio (CBR) test was performed on a representative bulk sample obtained from similar soils to those within the planned pavement areas. The sample was compacted (remolded) to approximately 90, 95 and 100 percent of the standard Proctor maximum dry density near the optimum moisture content.

Pavement sections at the site will consist of light duty flexible asphalt pavement which will make up the main ingress/egress access roadway and widening/turn-lanes along Dixie Drive and Glenn Street Extension as well as the northern and southern parking lots.

4.7.1 Subgrade Support Value

Based on the laboratory test results and considering our experience with similar soils under similar loading conditions, a CBR value of roughly 5.5 percent, corresponding to a resilient modulus (MR) of 7,600 psi, is recommended for use in design of the pavement sections. This is assuming that pavement subgrades are prepared in accordance with previous sections of this report. This also assumes that any fill material placed within the proposed pavement areas is placed and compacted according to the recommendations given in this report. Imported fill, if required, should be tested to determine that it exhibits a CBR equivalent to or exceeds the value assumed in pavement recommendations.

4.7.2 Traffic Volumes

As previously mentioned, on October 24, 2017, Mr. Kyle Clampitt, P.E. of Alliance provided S&ME with anticipated traffic volumes. A total of 500 passenger vehicles per weekday and 2,000 passenger vehicles per weekend day were used for the main ingress/egress access drive and widening/turn lanes.

The number of parking spaces depicted on the provided updated site plan were used to assume traffic volumes into each of the parking lots. It is our understanding that there will be approximately 327 spaces in the southern parking lot and 185 spaces in the northern parking lot. Therefore, approximately 60% and 40% of the total traffic volume entering the ingress/egress road were used for the parking lots, respectively.

4.7.3 Flexible Pavements

Pavement thickness computations were performed using the SCDOT *Pavement Design Guidelines* – 2008 and AASHTO '93 *Flexible Pavement Design Method* for analysis of the unreinforced flexible pavement sections. Based on the subsurface conditions and assuming our grading recommendations will be implemented as specified, the following presents our recommendations regarding typical pavement sections and materials.

Based on the provided updated site plan, conversations with Alliance Consulting Engineers, and our above noted assumptions, the following is anticipated for the flexible pavement areas:

Main Ingress/Egress Access Road and Widening/Turn Lanes:

- A design life of 20 years with 81,340 Equivalent Single Axle Loads (ESAL) over the design life.
- Average Weekly Traffic of 13,000 passenger car passes (provided 500 per weekday, 2,000 per weekend day, entering and exiting the site over a seven-day-week) with 0.006 ESAL per vehicle.

Using these traffic loadings, we recommend the following options for minimum flexible pavement sections for the main ingress/egress access road and widening/turn lanes below.

Table 5-1 – Recommended Flexible Pavement Section Thickness Options – Main Ingress/Egress Access Road & Widening/Turn Lanes

Option No.	Graded Aggregate Base Course	Asphalt Surface Course
1	10 in.	2½ in.
2	8½ in.	3 in.
3	7½ in.	3½ in.

Northern Parking Lot:

- A design life of 20 years with 32,540 Equivalent Single Axle Loads (ESAL) over the design life.
- Average Weekly Traffic of 5,200 passenger car passes (40% of total volume noted above) with 0.006 ESAL per vehicle.

Using these traffic loadings, we recommend the following options for minimum flexible pavement sections for the northern parking lot below.

Table 5-2 – Recommended Flexible Pavement Section Thickness Options – Northern Parking Lot

Option No.	Graded Aggregate Base Course	Asphalt Surface Course
1	9 in.	2 in.
2	8 in.	2½ in.
3	6½ in.	3 in.

Southern Parking Lot:

- A design life of 20 years with 48,800 Equivalent Single Axle Loads (ESAL) over the design life.
- Average Weekly Traffic of 7,800 passenger car passes (60% of total volume noted above) with 0.006 ESAL per vehicle.

Using these traffic loadings, we recommend the following options for minimum flexible pavement sections for the northern parking lot below.

Table 5-3 – Recommended Flexible Pavement Section Thickness Options – Southern Parking Lot

Option No.	Graded Aggregate Base Course	Asphalt Surface Course
1	10 in.	2 in.
2	8½ in.	2½ in.
3	7½ in.	3 in.

It is our opinion that the flexible pavement should consist of a wearing course of hot mix asphaltic (HMA) concrete and a base course of graded aggregate Macadam Base Course material. Graded aggregate

material is necessary for structural support and to help transport any rainwater that seeps below the pavement.

All materials and workmanship should meet the minimum requirements of the SCDOT *Standard Specifications for Highway Construction*, 2007 Edition and supplemental specifications. The applicable sections include the following:

Take 5-4 – SCDOT Bituminous Pavements Specifications

Section	2007 SCDOT Standard Specification Section
Subgrade	Section 208, page 130
Graded Aggregate Base Course	Section 305, page 159
Hot Mixed Asphalt Pavement	Section 401, page 188
Hot Mix Asphalt Surface Course	Section 403, page 220

Supplemental Specifications
HMA Material Properties, dated July 1, 2006
HMA Courses, dated July 2, 2006

Sufficient testing should be performed during flexible pavement installation to confirm that the required thickness, density, and quality requirements of the pavement specifications are followed. This is very important for the long-term performance of the pavement, and can be performed by S&ME, Inc. as part of our construction materials testing services.

4.7.4 Base Course Materials

Base course materials assumed in computation of pavement sections above consists of materials meeting the hardness, durability and gradation requirements of graded aggregate base course (GABC) defined in current SCDOT *Standard Specifications* (2007 ed.) section 305. The crushed stone graded aggregate base course (GABC) used in pavement section construction should meet the requirements of Section 305 of the SCDOT *Standard Specifications* (2007 ed.), and should consist of "Macadam Base Course" as defined by Section 305.02 of the SCDOT specification.

Fill placed in pavement areas should be compacted as recommended in preceding sections. Prior to pavement installation, all exposed pavement subgrades should be methodically proofrolled at final subgrade elevation under the observation of the S&ME, Inc. geotechnical engineer, and any identified unstable areas should be repaired as directed.

As stated in the SCDOT Section 305, new base course should be compacted to at least 100 percent of the modified Proctor maximum dry density (ASTM D-1557), and should not exhibit pumping or rutting under equipment traffic. Heavy compaction equipment is likely to be required in order to achieve the required base course compaction, and the moisture content of the material will likely need to be maintained very near the optimum moisture content in order to facilitate proper compaction. Base course of greater than 8 inches total thickness must be constructed in two lifts of approximately equal thickness. S&ME, Inc. should be contacted to perform field density and thickness testing of the base course prior to paving.

4.7.5 General

Pavement performance is very dependent on subgrade condition. Drainage will have a major impact on subgrade condition. Drainage should be designed to result in subsurface water levels being at least 2 feet below the top of the pavement subgrade. Design should not result in water standing on the pavement surface or behind curbing. Landscaped areas behind curbing should be at or above the elevation of the curbing. Design should result in positive drainage being available from the stone base material.

The performance of the pavement will be influenced by a number of factors including the actual condition of subgrade soils at the time of pavement installation, installed thicknesses and compaction, and drainage. The subgrade soils should be re-evaluated by proofrolling immediately prior to placement of base course stone and any unstable areas repaired. This recommendation is very important to the long-term performance of the pavements and slabs. Areas adjacent to pavements (embankments, landscaped island, ditching, etc.) which can drain water (rainwater or sprinklers) should be designed so that water does not seep below the pavements. This may require the use of French drains or swales. Sufficient tests and inspections should be performed during pavement installation to confirm that the required thickness, density, and quality requirements of the specifications are followed.

5.0 Qualifications of Report

This report has been prepared in accordance with generally accepted geotechnical engineering practice for specific application to this project. The conclusions and recommendations contained in this report were based on the applicable standards of our profession at the time this report was prepared. No other warranty, express or implied is made.

The analyses and recommendations submitted herein are based, in part, upon the data obtained from the subsurface exploration. The nature and extent of variations between the borings will not become evident until construction. If variations appear evident, then we will re-evaluate the recommendations of this report. In the event that any changes in the nature, design, or location of the proposed structures are planned, the conclusions and recommendations contained in this report will not be considered valid unless the changes are reviewed and conclusions modified or verified in writing.

We recommend that S&ME, Inc. be provided the opportunity to review the final design plans and specifications in order to ensure that earthwork and foundation recommendations are properly interpreted and implemented.

Appendices

Appendix I – Figures

SOURCE: Google Earth

SCALE:	NTS
CHECKED BY:	RCB
DRAWN BY:	HGM
DATE:	10/26/2017

S&ME

SITE LOCATION PLAN

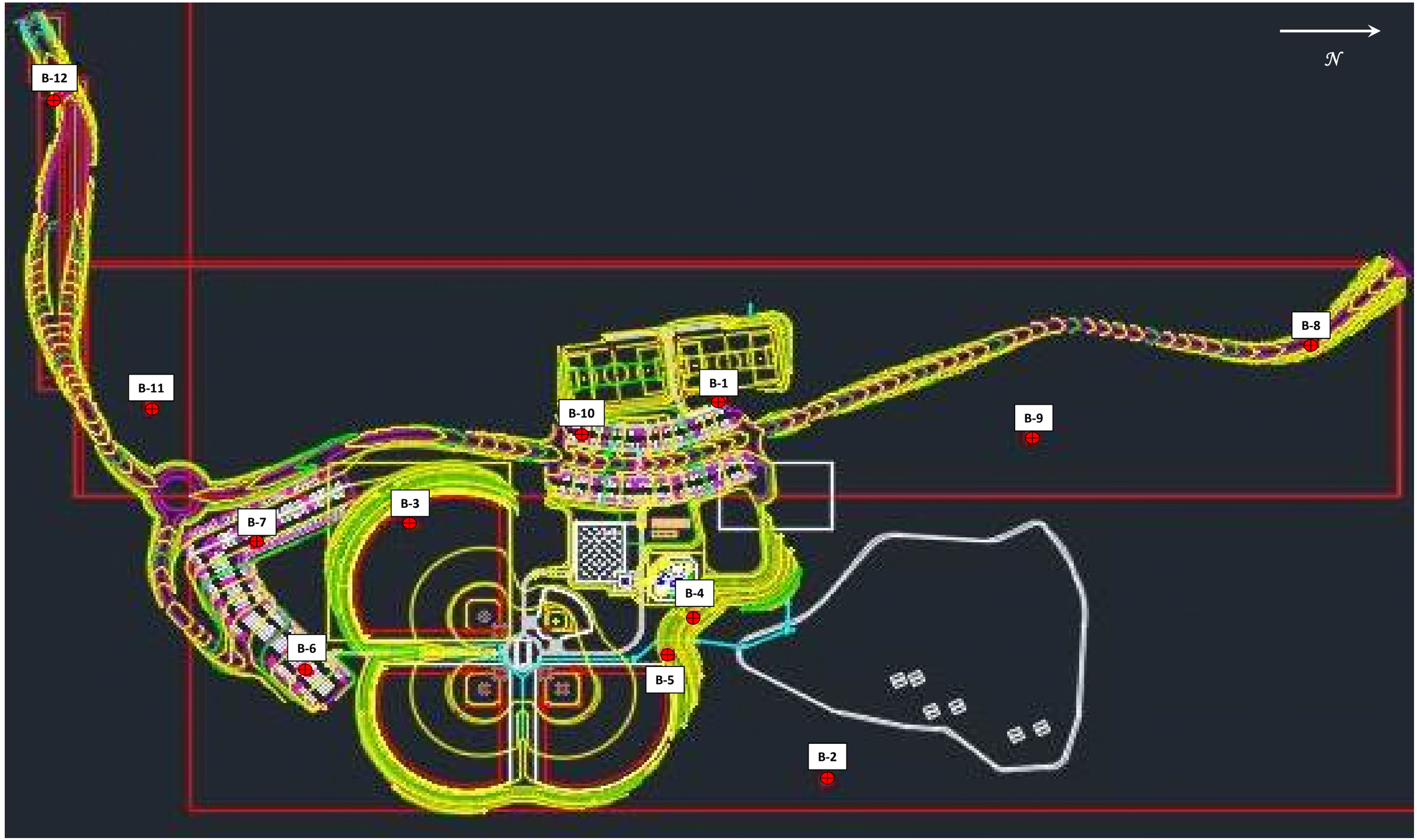
City of Newberry Recreation Complex

Newberry, South Carolina

JOB NO. 1461-17-025

FIGURE NO.

1



APPROXIMATE BORING LOCATION

SOURCE: Alliance Consulting Engineers

SCALE:	NTS
CHECKED BY:	RCB
DRAWN BY:	HGM
DATE:	10/26/2017

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BORING LOCATION PLAN

City of Newberry Recreation Complex

Newberry, South Carolina

JOB NO.: 1461-17-025

FIGURE NO.

2

Appendix II – Field Data

LEGEND TO SOIL CLASSIFICATION AND SYMBOLS

SOIL TYPES

(Shown in Graphic Log)

Fill
Asphalt
Concrete
Topsoil
Gravel
Sand
Silt
Clay
Organic
Silty Sand
Clayey Sand
Sandy Silt
Clayey Silt
Sandy Clay
Silty Clay
Partially Weathered Rock
Cored Rock

WATER LEVELS

(Shown in Water Level Column)

▽ = Water Level At Termination of Boring
▼ = Water Level Taken After 24 Hours
◄ = Loss of Drilling Water
HC = Hole Cave

CONSISTENCY OF COHESIVE SOILS

CONSISTENCY	STD. PENETRATION RESISTANCE BLOWS/FOOT
Very Soft	0 to 2
Soft	3 to 4
Firm	5 to 8
Stiff	9 to 15
Very Stiff	16 to 30
Hard	31 to 50
Very Hard	Over 50

RELATIVE DENSITY OF COHESIONLESS SOILS

RELATIVE DENSITY	STD. PENETRATION RESISTANCE BLOWS/FOOT
Very Loose	0 to 4
Loose	5 to 10
Medium Dense	11 to 30
Dense	31 to 50
Very Dense	Over 50

SAMPLER TYPES

(Shown in Samples Column)

Shelby Tube
Split Spoon
Rock Core
No Recovery

TERMS

Standard Penetration Resistance - The Number of Blows of 140 lb. Hammer Falling 30 in. Required to Drive 1.4 in. I.D. Split Spoon Sampler 1 Foot. As Specified in ASTM D-1586.

REC - Total Length of Rock Recovered in the Core Barrel Divided by the Total Length of the Core Run Times 100%.

RQD - Total Length of Sound Rock Segments Recovered that are Longer Than or Equal to 4" (mechanical breaks excluded) Divided by the Total Length of the Core Run Times 100%.

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PROJECT: **City of Newberry Recreation Complex**
Newberry, South Carolina
S&ME Project No. 1461-17-025

BORING LOG B-1

DATE DRILLED: **3/29/17**	ELEVATION: **560.0 ft**
DRILL RIG: **Diedrich D-50**	BORING DEPTH: **5.0 ft**
DRILLER: **S. Gowan**	WATER LEVEL: **Not Encountered**
HAMMER TYPE: **Auto**	LOGGED BY: **HGM**
SAMPLING METHOD: **Split spoon**	NORTHING: **883090** EASTING: **1820483**
DRILLING METHOD: **3¼" H.S.A.**	

NOTES: Northing, easting, and elevation were estimated from Google Earth. No formal survey was completed by S&ME.

DEPTH (feet)	MATERIAL DESCRIPTION	WATER LEVEL	ELEVATION (feet-MSL)	SAMPLE NO.	SAMPLE TYPE	BLOW COUNT / CORE DATA 1st 6in / RUN #	2nd 6in / REC	3rd 6in / RQD	STANDARD PENETRATION TEST DATA (blows/ft) / REMARKS	N VALUE
	SURFACE MATERIALS - 2 inches of TOPSOIL.									
	PIEDMONT - SANDY LEAN CLAY (CL) - mostly low to medium plasticity fines, some fine sands, moist, red, stiff.	HC		SS-1		3	5	5		10
	- - - @ 3 feet - trace mica.			SS-2		3	5	8		13
5	Boring terminated at 5 ft		555.0							

STANDARD PENETRATION TEST DATA (blows/ft) / REMARKS: 10 20 30 60 80

S&ME BORING LOG 1461-17-025 BORING LOGS.GPJ S&ME 2011_03_09.GDT 10/26/17

NOTES:

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2. ***BORING, SAMPLING AND PENETRATION TEST DATA IN GENERAL ACCORDANCE WITH ASTM D-1586.***
3. ***STRATIFICATION AND GROUNDWATER DEPTHS ARE NOT EXACT.***
4. ***WATER LEVEL IS AT TIME OF EXPLORATION AND WILL VARY.***

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PROJECT: **City of Newberry Recreation Complex**
Newberry, South Carolina
S&ME Project No. 1461-17-025

BORING LOG B-2

DATE DRILLED: **3/29/17**	ELEVATION: **545.0 ft**
DRILL RIG: **Diedrich D-50**	BORING DEPTH: **5.0 ft**
DRILLER: **S. Gowan**	WATER LEVEL: **Not Encountered**
HAMMER TYPE: **Auto**	LOGGED BY: **HGM**
SAMPLING METHOD: **Split spoon**	NORTHING: **883362** / EASTING: **1821546**
DRILLING METHOD: **3¼" H.S.A.**	

NOTES: Northing, easting, and elevation were estimated from Google Earth. No formal survey was completed by S&ME.

DEPTH (feet)	MATERIAL DESCRIPTION	WATER LEVEL	ELEVATION (feet-MSL)	SAMPLE NO.	SAMPLE TYPE	BLOW COUNT / CORE DATA 1st 6in / RUN #	2nd 6in / REC	3rd 6in / RQD	STANDARD PENETRATION TEST DATA (blows/ft) / REMARKS	N VALUE
	SURFACE MATERIALS - 2 inches of TOPSOIL.									
	PIEDMONT - CLAYEY SAND (SC) - mostly fine to medium sands, some low to medium plasticity fines, moist, tan, loose.	HC		SS-1		3	3	3		6
	SANDY LEAN CLAY (CL) - mostly low to medium plasticity fines, some fine sands, moist, brown, stiff.			SS-2		4	4	6		10
5	Boring terminated at 5 ft		540.0							

STANDARD PENETRATION TEST DATA (blows/ft) / REMARKS: 10 20 30 60 80

S&ME BORING LOG 1461-17-025 BORING LOGS.GPJ S&ME 2011_03_09.GDT 10/26/17

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4. ***WATER LEVEL IS AT TIME OF EXPLORATION AND WILL VARY.***

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PROJECT: **City of Newberry Recreation Complex**
Newberry, South Carolina
S&ME Project No. 1461-17-025

BORING LOG B-3

DATE DRILLED: **3/29/17** | ELEVATION: **576.0 ft**

DRILL RIG: **Diedrich D-50** | BORING DEPTH: **5.0 ft**

DRILLER: **S. Gowan** | WATER LEVEL: **Not Encountered**

HAMMER TYPE: **Auto** | LOGGED BY: **HGM**

NOTES: Northing, easting, and elevation were estimated from Google Earth. No formal survey was completed by S&ME.

SAMPLING METHOD: **Split spoon** | NORTHING: **882297** | EASTING: **1820831**

DRILLING METHOD: **3¼" H.S.A.**

DEPTH (feet)	GRAPHIC LOG	MATERIAL DESCRIPTION	WATER LEVEL	ELEVATION (feet-MSL)	SAMPLE NO.	SAMPLE TYPE	BLOW COUNT / CORE DATA 1st 6in / RUN #	2nd 6in / REC	3rd 6in / RQD	STANDARD PENETRATION TEST DATA (blows/ft) / REMARKS	N VALUE
		SURFACE MATERIALS - 0.5 inches of TOPSOIL.									
		PIEDMONT - CLAYEY SAND (SC) - mostly fine sands, little low plasticity fines, dry to moist, red, loose.	HC		SS-1		4	4	4		8
		- - - @ 3 feet - moist, medium dense.			SS-2		8	12	16		28
5		Boring terminated at 5 ft		571.0							

10 20 30 60 80

S&ME BORING LOG 1461-17-025 BORING LOGS.GPJ S&ME 2011_03_09.GDT 10/26/17

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3. *STRATIFICATION AND GROUNDWATER DEPTHS ARE NOT EXACT.*
4. *WATER LEVEL IS AT TIME OF EXPLORATION AND WILL VARY.*

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PROJECT: **City of Newberry Recreation Complex**
Newberry, South Carolina
S&ME Project No. 1461-17-025

BORING LOG B-4

DATE DRILLED: **3/29/17**	ELEVATION: **539.0 ft**
DRILL RIG: **Diedrich D-50**	BORING DEPTH: **10.0 ft**
DRILLER: **S. Gowan**	WATER LEVEL: **7' ATD**
HAMMER TYPE: **Auto**	LOGGED BY: **HGM**
SAMPLING METHOD: **Split spoon**	NORTHING: **883022** / EASTING: **1821086**
DRILLING METHOD: **3¼" H.S.A.**	

NOTES: Northing, easting, and elevation were estimated from Google Earth. No formal survey was completed by S&ME.

DEPTH (feet)	MATERIAL DESCRIPTION	WATER LEVEL	ELEVATION (feet-MSL)	SAMPLE NO.	SAMPLE TYPE	BLOW COUNT / CORE DATA 1st 6in / RUN #	2nd 6in / REC	3rd 6in / RQD	STANDARD PENETRATION TEST DATA (blows/ft) / REMARKS	N VALUE
	SURFACE MATERIALS - 7 inches of TOPSOIL.									
	PIEDMONT - CLAYEY SAND (SC) - mostly fine sands, some low to medium plasticity fines, moist, gray and yellowish-brown, loose.			SS-1		2	3	3		6
	- - - @ 3 feet - little low to medium plasticity fines, moist to wet, gray.			SS-2		2	3	5		8
5	**SILTY SAND (SM)** - mostly fine to medium sands, little low plasticity fines, trace mica, moist, brown, medium dense.	HC ▽	534.0	SS-3		5	7	8		15
	- - - @ 8 feet - mostly fine to coarse sands, olive and brown.			SS-4		6	6	8		14
10	Boring terminated at 10 ft		529.0							

STANDARD PENETRATION TEST DATA (blows/ft) / REMARKS: 10 20 30 60 80

S&ME BORING LOG 1461-17-025 BORING LOGS.GPJ S&ME 2011_03_09.GDT 10/26/17

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PROJECT: **City of Newberry Recreation Complex**
Newberry, South Carolina
S&ME Project No. 1461-17-025

BORING LOG B-5

DATE DRILLED: **3/29/17**	ELEVATION: **542.0 ft**
DRILL RIG: **Diedrich D-50**	BORING DEPTH: **15.0 ft**
DRILLER: **S. Gowan**	WATER LEVEL: **7' 24 hr**
HAMMER TYPE: **Auto**	LOGGED BY: **HGM**
SAMPLING METHOD: **Split spoon**	NORTHING: **882959** EASTING: **1821196**
DRILLING METHOD: **3¼" H.S.A.**	

NOTES: Northing, easting, and elevation were estimated from Google Earth. No formal survey was completed by S&ME.

DEPTH (feet)	MATERIAL DESCRIPTION	ELEVATION (feet-MSL)	SAMPLE NO.	SAMPLE TYPE	BLOW COUNT / CORE DATA 1st 6in / RUN #	2nd 6in / REC	3rd 6in / RQD	STANDARD PENETRATION TEST DATA (blows/ft) / REMARKS	N VALUE
	PIEDMONT - CLAYEY SAND (SC) - mostly fine sands, some low to medium plasticity fines, moist, tan, loose.		SS-1		3	3	5		8
	- - - @ 3 feet - trace organics, medium dense.		SS-2		3	5	6		11
5		537.0							
	- - - @ 6 feet - gray and brown, loose.		SS-3		4	5	5		10
	SANDY SILT (ML) - mostly low plasticity fines, some fine sands, trace mica, moist, olive and black, stiff.		SS-4		5	6	7		13
10	- - - @ 10 feet - absent mica, absent organics, yellowish-brown, firm.	532.0							
			SS-5		3	3	4		7
15	Boring terminated at 15 ft	527.0							

STANDARD PENETRATION TEST DATA (blows/ft) / REMARKS: 10 20 30 60 80

S&ME BORING LOG 1461-17-025 BORING LOGS.GPJ S&ME 2011_03_09.GDT 10/26/17

NOTES:

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3. ***STRATIFICATION AND GROUNDWATER DEPTHS ARE NOT EXACT.***
4. ***WATER LEVEL IS AT TIME OF EXPLORATION AND WILL VARY.***

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PROJECT: **City of Newberry Recreation Complex**
Newberry, South Carolina
S&ME Project No. 1461-17-025

BORING LOG B-6

DATE DRILLED: **3/29/17**	ELEVATION: **569.0 ft**
DRILL RIG: **Diedrich D-50**	BORING DEPTH: **10.0 ft**
DRILLER: **S. Gowan**	WATER LEVEL: **Not Encountered**
HAMMER TYPE: **Auto**	LOGGED BY: **HGM**
SAMPLING METHOD: **Split spoon**	NORTHING: **882028** / EASTING: **1821241**
DRILLING METHOD: **3¼" H.S.A.**	

NOTES: Northing, easting, and elevation were estimated from Google Earth. No formal survey was completed by S&ME.

DEPTH (feet)	MATERIAL DESCRIPTION	WATER LEVEL	ELEVATION (feet-MSL)	SAMPLE NO.	SAMPLE TYPE	BLOW COUNT / CORE DATA 1st 6in / RUN #	2nd 6in / REC	3rd 6in / RQD	STANDARD PENETRATION TEST DATA (blows/ft) / REMARKS	N VALUE
	PIEDMONT - CLAYEY SAND (SC) - mostly fine sands, some low plasticity fines, dry to moist, red, medium dense.			SS-1		6	9	10		19
	- - - @ 3 feet - moist, red and tan.	HC		SS-2		7	9	11		20
5			564.0							
	- - - @ 6 feet - loose.			SS-3		4	4	5		9
	- - - @ 8 feet - medium dense.			SS-4		5	6	8		14
10			559.0							
	Boring terminated at 10 ft									

10 20 30 60 80

S&ME BORING LOG 1461-17-025 BORING LOGS.GPJ S&ME 2011_03_09.GDT 10/26/17

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3. ***STRATIFICATION AND GROUNDWATER DEPTHS ARE NOT EXACT.***
4. ***WATER LEVEL IS AT TIME OF EXPLORATION AND WILL VARY.***

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PROJECT: **City of Newberry Recreation Complex**
Newberry, South Carolina
S&ME Project No. 1461-17-025

BORING LOG B-7

DATE DRILLED: **3/29/17**	ELEVATION: **576.0 ft**
DRILL RIG: **Diedrich D-50**	BORING DEPTH: **10.0 ft**
DRILLER: **S. Gowan**	WATER LEVEL: **Not Encountered**
HAMMER TYPE: **Auto**	LOGGED BY: **HGM**
SAMPLING METHOD: **Split spoon**	NORTHING: **881899** / EASTING: **1820888**
DRILLING METHOD: **3¼" H.S.A.**	

NOTES: Northing, easting, and elevation were estimated from Google Earth. No formal survey was completed by S&ME.

DEPTH (feet)	MATERIAL DESCRIPTION	WATER LEVEL	ELEVATION (feet-MSL)	SAMPLE NO.	SAMPLE TYPE	BLOW COUNT / CORE DATA 1st 6in / RUN #	2nd 6in / REC	3rd 6in / RQD	STANDARD PENETRATION TEST DATA (blows/ft) / REMARKS	N VALUE
	SURFACE MATERIALS - 1 inch of TOPSOIL.									
	PIEDMONT - CLAYEY SAND (SC) - mostly fine sands, little low plasticity fines, dry to moist, tan and red, medium dense.			SS-1		8	8	12		20
	- - - @ 3 feet - dense.			SS-2		8	14	20		34
5		HC	571.0							
	- - - @ 6 feet - trace mica, moist, medium dense.			SS-3		7	10	15		25
				SS-4		5	8	10		18
10			566.0							
	Boring terminated at 10 ft									

NOTES:

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3. ***STRATIFICATION AND GROUNDWATER DEPTHS ARE NOT EXACT.***
4. ***WATER LEVEL IS AT TIME OF EXPLORATION AND WILL VARY.***

S&ME

PROJECT:	**City of Newberry Recreation Complex** **Newberry, South Carolina** **S&ME Project No. 1461-17-025**	**BORING LOG B-8**
DATE DRILLED: **3/28/17**	ELEVATION: **516.0 ft**	**NOTES:** Northing, easting, and elevation were estimated from Google Earth. No formal survey was completed by S&ME.
DRILL RIG: **Diedrich D-50**	BORING DEPTH: **5.0 ft**	
DRILLER: **S. Gowan**	WATER LEVEL: **Not Encountered**	
HAMMER TYPE: **Auto**	LOGGED BY: **HGM**	
SAMPLING METHOD: **Split spoon**	NORTHING: **884617**	EASTING: **1820326**
DRILLING METHOD: **3¼" H.S.A.**		

DEPTH (feet)	GRAPHIC LOG	MATERIAL DESCRIPTION	WATER LEVEL	ELEVATION (feet-MSL)	SAMPLE NO.	SAMPLE TYPE	BLOW COUNT / CORE DATA 1st 6in / RUN #	2nd 6in / REC	3rd 6in / RQD	STANDARD PENETRATION TEST DATA (blows/ft) / REMARKS (10 20 30 60 80)	N VALUE
		SURFACE MATERIALS - 3 inches of TOPSOIL.									
		PIEDMONT - CLAYEY SAND (SC) - mostly fine to medium sands, little low plasticity fines, dry to moist, white and brown, dense.	HC		SS-1		12	18	30		48
		- - - @ 3 feet - brown, medium dense.			SS-2		9	11	11		22
5		Boring terminated at 5 ft		511.0							

S&ME BORING LOG 1461-17-025 BORING LOGS.GPJ S&ME 2011_03_09.GDT 10/26/17

NOTES:

1. ***THIS LOG IS ONLY A PORTION OF A REPORT PREPARED FOR THE NAMED PROJECT AND MUST ONLY BE USED TOGETHER WITH THAT REPORT.***
2. ***BORING, SAMPLING AND PENETRATION TEST DATA IN GENERAL ACCORDANCE WITH ASTM D-1586.***
3. ***STRATIFICATION AND GROUNDWATER DEPTHS ARE NOT EXACT.***
4. ***WATER LEVEL IS AT TIME OF EXPLORATION AND WILL VARY.***

S&ME

PROJECT: **City of Newberry Recreation Complex**
Newberry, South Carolina
S&ME Project No. 1461-17-025

BORING LOG B-9

DATE DRILLED: **3/28/17** | ELEVATION: **535.0 ft**

DRILL RIG: **Diedrich D-50** | BORING DEPTH: **5.0 ft**

DRILLER: **S. Gowan** | WATER LEVEL: **Not Encountered**

HAMMER TYPE: **Auto** | LOGGED BY: **HGM**

NOTES: Northing, easting, and elevation were estimated from Google Earth. No formal survey was completed by S&ME.

SAMPLING METHOD: **Split spoon** | NORTHING: **883892** | EASTING: **1820590**

DRILLING METHOD: **3¼" H.S.A.**

DEPTH (feet)	GRAPHIC LOG	MATERIAL DESCRIPTION	WATER LEVEL	ELEVATION (feet-MSL)	SAMPLE NO.	SAMPLE TYPE	BLOW COUNT / CORE DATA 1st 6in / RUN #	2nd 6in / REC	3rd 6in / RQD	STANDARD PENETRATION TEST DATA (blows/ft) / REMARKS	N VALUE
		SURFACE MATERIALS - 2 inches of TOPSOIL.									
		PIEDMONT - CLAYEY SAND (SC) - mostly fine sands, little medium to high plasticity fines, dry to moist, olive and yellowish-brown, medium dense.			SS-1		6	8	10		18
		- - - @ 3 feet - some low plasticity fines, yellowish-brown, dense.	HC		SS-2		8	13	20		33
5		Boring terminated at 5 ft		530.0							

10 20 30 60 80

S&ME BORING LOG 1461-17-025 BORING LOGS.GPJ S&ME 2011_03_09.GDT 10/26/17

NOTES:

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2. ***BORING, SAMPLING AND PENETRATION TEST DATA IN GENERAL ACCORDANCE WITH ASTM D-1586.***
3. ***STRATIFICATION AND GROUNDWATER DEPTHS ARE NOT EXACT.***
4. ***WATER LEVEL IS AT TIME OF EXPLORATION AND WILL VARY.***

S&ME

PROJECT: **City of Newberry Recreation Complex**
Newberry, South Carolina
S&ME Project No. 1461-17-025

BORING LOG B-10

DATE DRILLED: **3/29/17**	ELEVATION: **571.0 ft**	**NOTES:** Northing, easting, and elevation were estimated from Google Earth. No formal survey was completed by S&ME.
DRILL RIG: **Diedrich D-50**	BORING DEPTH: **5.0 ft**	
DRILLER: **S. Gowan**	WATER LEVEL: **Not Encountered**	
HAMMER TYPE: **Auto**	LOGGED BY: **HGM**	
SAMPLING METHOD: **Split spoon**	NORTHING: **882742**	EASTING: **1820583**
DRILLING METHOD: **3¼" H.S.A.**		

DEPTH (feet)	GRAPHIC LOG	MATERIAL DESCRIPTION	WATER LEVEL	ELEVATION (feet-MSL)	SAMPLE NO.	SAMPLE TYPE	BLOW COUNT / CORE DATA 1st 6in / RUN #	2nd 6in / REC	3rd 6in / RQD	STANDARD PENETRATION TEST DATA (blows/ft) / REMARKS	N VALUE
		SURFACE MATERIALS - 2 inches of TOPSOIL.									
		PIEDMONT - SANDY FAT CLAY (CH) - mostly high plasticity fines, some fine sands, moist, red, very stiff.			SS-1		8	11	15		26
					SS-2		4	7	10		17
5		Boring terminated at 5 ft		566.0							

STANDARD PENETRATION TEST DATA (blows/ft) / REMARKS: 10 20 30 60 80

S&ME BORING LOG 1461-17-025 BORING LOGS.GPJ S&ME 2011_03_09.GDT 10/26/17

NOTES:

1. ***THIS LOG IS ONLY A PORTION OF A REPORT PREPARED FOR THE NAMED PROJECT AND MUST ONLY BE USED TOGETHER WITH THAT REPORT.***
2. ***BORING, SAMPLING AND PENETRATION TEST DATA IN GENERAL ACCORDANCE WITH ASTM D-1586.***
3. ***STRATIFICATION AND GROUNDWATER DEPTHS ARE NOT EXACT.***
4. ***WATER LEVEL IS AT TIME OF EXPLORATION AND WILL VARY.***

S&ME

PROJECT: **City of Newberry Recreation Complex**
Newberry, South Carolina
S&ME Project No. 1461-17-025

BORING LOG B-11

DATE DRILLED: **3/29/17**	ELEVATION: **576.0 ft**
DRILL RIG: **Diedrich D-50**	BORING DEPTH: **5.0 ft**
DRILLER: **S. Gowan**	WATER LEVEL: **Not Encountered**
HAMMER TYPE: **Auto**	LOGGED BY: **HGM**
SAMPLING METHOD: **Split spoon**	NORTHING: **881627** / EASTING: **1820504**
DRILLING METHOD: **3¼" H.S.A.**	

NOTES: Northing, easting, and elevation were estimated from Google Earth. No formal survey was completed by S&ME.

DEPTH (feet)	GRAPHIC LOG	MATERIAL DESCRIPTION	WATER LEVEL	ELEVATION (feet-MSL)	SAMPLE NO.	SAMPLE TYPE	BLOW COUNT / CORE DATA 1st 6in / RUN #	2nd 6in / REC	3rd 6in / RQD	STANDARD PENETRATION TEST DATA (blows/ft) / REMARKS	N VALUE
		SURFACE MATERIALS - 6 inches of TOPSOIL.									
		PIEDMONT - CLAYEY SAND (SC) - mostly fine sands, some medium to high plasticity fines, trace subangular quartz gravel, moist, reddish-brown, loose.	HC		SS-1		1	2	4		6
		- - - @ 3 feet - absent gravel, tan and reddish-brown, medium dense.			SS-2		3	6	7		13
5		Boring terminated at 5 ft		571.0							

10 20 30 60 80

S&ME BORING LOG 1461-17-025 BORING LOGS.GPJ S&ME 2011_03_09.GDT 10/26/17

NOTES:

1. ***THIS LOG IS ONLY A PORTION OF A REPORT PREPARED FOR THE NAMED PROJECT AND MUST ONLY BE USED TOGETHER WITH THAT REPORT.***
2. ***BORING, SAMPLING AND PENETRATION TEST DATA IN GENERAL ACCORDANCE WITH ASTM D-1586.***
3. ***STRATIFICATION AND GROUNDWATER DEPTHS ARE NOT EXACT.***
4. ***WATER LEVEL IS AT TIME OF EXPLORATION AND WILL VARY.***

S&ME

PROJECT: **City of Newberry Recreation Complex**
Newberry, South Carolina
S&ME Project No. 1461-17-025

BORING LOG B-12

DATE DRILLED: **3/29/17** | ELEVATION: **565.0 ft**

DRILL RIG: **Diedrich D-50** | BORING DEPTH: **5.0 ft**

DRILLER: **S. Gowan** | WATER LEVEL: **Not Encountered**

HAMMER TYPE: **Auto** | LOGGED BY: **HGM**

NOTES: Northing, easting, and elevation were estimated from Google Earth. No formal survey was completed by S&ME.

SAMPLING METHOD: **Split spoon** | NORTHING: **881387** | EASTING: **1819649**

DRILLING METHOD: **3¼" H.S.A.**

DEPTH (feet)	GRAPHIC LOG	MATERIAL DESCRIPTION	WATER LEVEL	ELEVATION (feet-MSL)	SAMPLE NO.	SAMPLE TYPE	BLOW COUNT / CORE DATA 1st 6in / RUN #	2nd 6in / REC	3rd 6in / RQD	STANDARD PENETRATION TEST DATA (blows/ft) / REMARKS	N VALUE
		SURFACE MATERIALS - 2 inches of TOPSOIL.									
		PIEDMONT - CLAYEY SAND (SC) - mostly fine sands, little low to medium plasticity fines, trace organics, dry to moist, tan and reddish-brown, medium dense.			SS-1		8	9	12		21
		- - - @ 3 feet - some low to medium plasticity fines, absent organics, moist.			SS-2		10	12	16		28
5		Boring terminated at 5 ft		560.0							

10 20 30 60 80

S&ME BORING LOG 1461-17-025 BORING LOGS.GPJ S&ME 2011_03_09.GDT 10/26/17

NOTES:

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2. ***BORING, SAMPLING AND PENETRATION TEST DATA IN GENERAL ACCORDANCE WITH ASTM D-1586.***
3. ***STRATIFICATION AND GROUNDWATER DEPTHS ARE NOT EXACT.***
4. ***WATER LEVEL IS AT TIME OF EXPLORATION AND WILL VARY.***

S&ME

Summary of Field Procedures

❖ Boring and Sampling

Soil Test Boring with Hollow-Stem Auger

Soil sampling and penetration testing were performed in general accordance with ASTM D1586, *Standard Test Method for Penetration Test and Split Barrel Sampling of Soils*. Borings were made by mechanically twisting a continuous steel hollow stem auger into the soil. At regular intervals, soil samples were obtained with a standard 1.4-inch I. D., 2-inch O. D., split barrel sampler. The sampler was first seated six inches to penetrate any loose cuttings, then driven an additional 12 inches with blows of a 140-pound hammer falling 30 inches. The number of hammer blows required to drive the sampler through the two final six inch increments was recorded as the penetration resistance (SPT N) value. The N-value, when properly interpreted by qualified professional staff, is an index of the soil strength and foundation support capability.

Bulk Samples

At selected locations and depths, representative bulk samples of the soils were obtained by randomly taking shovel loads from the cuttings or spoil brought to the surface, until a sample of 30 to 50 pounds was obtained. The sample was placed in a cloth or plastic sack marked with appropriate descriptive information. Samples were protected from freezing at all times.

Borehole Closure

Following collection of relevant geotechnical data, boreholes were filled by slowly pouring auger cuttings into the open hole such that minimal "bridging" of the material occurred in the hole. Backfilling of the upper two feet of each hole was tamped as heavily as possible with a shovel handle or other hand held equipment, and the backfill crowned to direct rainfall away on the surface. Where boreholes exceeded five feet in depth, a plastic hole plug was firmly tamped into place within the backfill at a depth of about two feet.

Preservation and Transporting of Soil Samples with Control of Field Moisture

Procedures for preserving soil samples obtained in the field and transportation of samples to the laboratory generally followed those given in ASTM D4220, *Standard Practice for Preserving and Transporting Soil Samples* for Group B samples as defined in Section 4. Group B samples are those samples not suspected of being contaminated and for which only water content and classification, proctor, relative density, or profile logging will be performed. Group B samples also include bulk samples that are intended to be remolded in the laboratory for compaction, swell pressure, percent swell, consolidation, permeability, CBR, or shear testing. Representative samples of the cuttings or split spoon samples, or representative bulk samples, were placed in suitably identified, sealed glass jars or plastic containers and transported to the laboratory. Sample identification numbers on the containers corresponded to sample

numbers recorded on field boring records or test pit records. Thin-walled tube samples were sealed at the ends with paraffin and capped with plastic end caps.

❖ Field Tests of Earth Materials

The subsurface conditions encountered during drilling were reported on a field test boring record by the chief driller. The record contains information about the drilling method, samples attempted and sample recovery, indications of materials in the borings such as coarse gravel, cobbles, etc., and indications of materials encountered between sample intervals. Representative soil samples were placed in glass jars and transported to the laboratory along with the field boring records. Recovered samples not expended in laboratory tests are commonly retained in our laboratory for 60 days following completion of drilling. Field boring records are retained at our office.

Measurement of Static Water Levels

Water level readings were made in the open boreholes immediately after completing drilling and withdrawal of the tools. Where feasible, measurements were repeated after an elapsed period of 24 hours to gauge the stabilized water level. Procedures for measurement of liquid levels in open boreholes are described in ASTM D4750, *Standard Test Method for Determining Subsurface Liquid Levels in a Borehole or Monitoring Well (Observation Well)*. A weighted measuring tape was slowly lowered into each borehole until the liquid surface was penetrated by the weighted end. The reading on the tape was recorded at a reference point on the surface and compared to the reading at the demarcation of the wetted and unwetted portions of the tape. The difference between the two readings was recorded as the depth of the liquid surface below the reference point. Measurements made by this method were then repeated until approximately consistent values were obtained.

Appendix III – Laboratory Results

Form No. TR-D4318-T89-90
Revision No. 0
Revision Date: 11/20/07

Liquid Limit, Plastic Limit, and Plastic Index

Another code *ASTM D 4318* ☒ *AASHTO T 89* ☐ *AASHTO T 90* ☐ ***Quality Assurance***

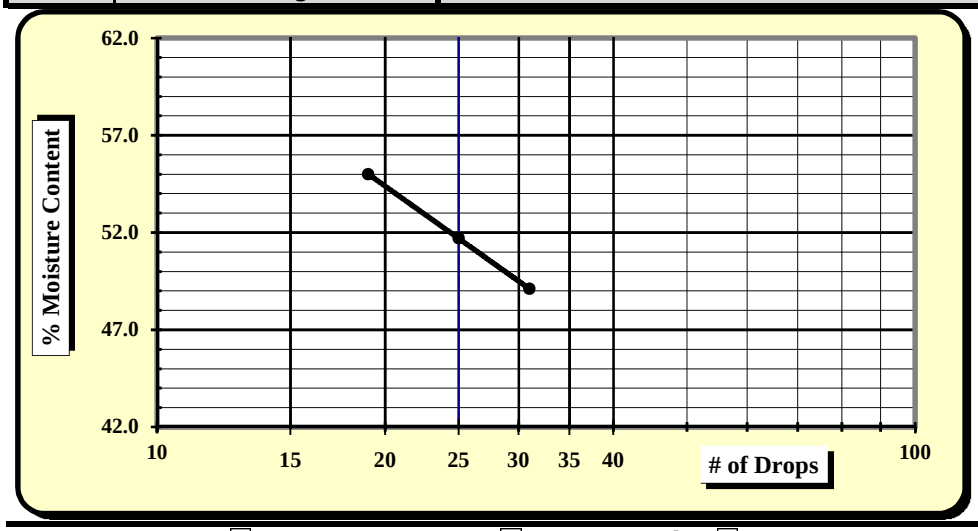
S&ME, Inc. - Greenville 48 Brookfield Oaks Dr., Suite F Greenville, SC 29607

Project #:	**1461-17-025**	Report Date:	4/12/17
Project Name:	City of Newberry Recreation Complex	Test Date(s)	4/11/17
Client Name:	Alliance Consulting Engineers		
Client Address:	P.O. Box 8147, Columbia, SC		

Boring #:	B-8 thru B-12 composite	Log #:	36g	Sample Date:	3/29/17
Location:	pavements	Type:	Bulk	Depth:	0 - 5'
Sample Description:	Sandy Fat Clay (CH)				

Type and Specification	*S&ME ID #*	*Cal Date:*	*Type and Specification*	*S&ME ID #*	*Cal Date:*
Balance (0.01 g)	13942	8/3/2016	Grooving tool	23119	10/15/2016
LL Apparatus	23158	2/1/2017			
Oven	13978	10/7/2016			

Pan #		Liquid Limit						Plastic Limit		
	Tare #:	1	2	3				4	5	
A	Tare Weight	26.70	26.50	26.37				25.95	26.97	
B	Wet Soil Weight + A	43.31	42.44	42.16				33.37	33.96	
C	Dry Soil Weight + A	37.84	37.01	36.56				31.71	32.39	
D	Water Weight (B-C)	5.47	5.43	5.60				1.66	1.57	
E	Dry Soil Weight (C-A)	11.14	10.51	10.19				5.76	5.42	
F	% Moisture (D/E)*100	49.1%	51.7%	55.0%				28.8%	29.0%	
N	# OF DROPS	31	25	19				*Moisture Contents determined by ASTM D 2216*		
LL	LL = **F** * FACTOR									
Ave.	*Average*							**28.9%**		



One Point Liquid Limit			
N	**Factor**	**N**	**Factor**
20	0.974	26	1.005
21	0.979	27	1.009
22	0.985	28	1.014
23	0.99	29	1.018
24	0.995	30	1.022
25	1.000		

NP, Non-Plastic ☐
Liquid Limit **52**
Plastic Limit **29**
Plastic Index **23**
Group Symbol **CH**

Multipoint Method ☑
One-point Method ☐

Wet Preparation ☐ Dry Preparation ☐ Air Dried ☑ **Percent Passing the #200 Sieve: 60.5%**

Notes / Deviations / References: Group symbol for minus #40 sieve portion only

ASTM D 4318: Liquid Limit, Plastic Limit, & Plastic Index of Soils

Benjamin Kovaleski	4/12/17	Brian Vaughan	4/12/17
Technician Name	*Date*	*Technical Responsibility*	*Date*

Sieve Analysis of Soils

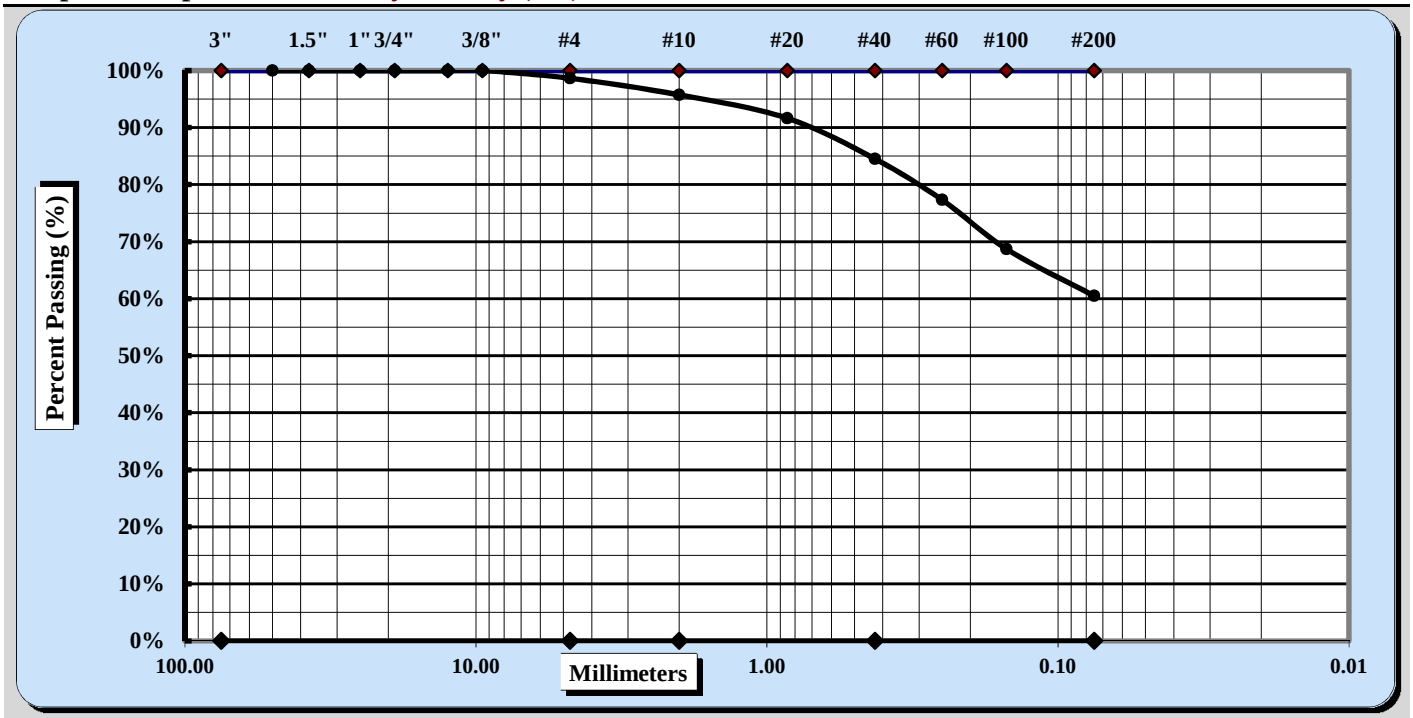
ASTM D 422

Quality Assurance

S&ME, Inc. - Greenville 48 Brookfield Oaks Dr., Suite F Greenville, SC 29607

Project #:	**1461-17-025**	Report Date:	4/12/17
Project Name:	City of Newberry Recreation Complex	Test Date(s):	4/08 - 4/12/17
Client Name:	Alliance Consulting Engineers		
Client Address:	P.O. Box 8147, Columbia, SC		
Boring #:	B-8 thru B-12 composite	Log #: 36g	Sample Date: 3/29/17
Location:	pavements	Type: Bulk	Depth: 0 - 5'

Sample Description: Sandy Fat Clay (CH)



Cobbles	< 300 mm (12") and > 75 mm (3")	Fine Sand	< 0.425 mm and > 0.075 mm (#200)
Gravel	< 75 mm and > 4.75 mm (#4)	Silt	< 0.075 and > 0.005 mm
Coarse Sand	< 4.75 mm and >2.00 mm (#10)	Clay	< 0.005 mm
Medium Sand	< 2.00 mm and > 0.425 mm (#40)	Colloids	< 0.001 mm

Maximum Particle Size	9.50 mm	Coarse Sand	2.9%	Fine Sand	24.0%
Gravel	1.4%	Medium Sand	11.2%	Silt & Clay	60.5%
Liquid Limit	52	Plastic Limit	29	Plastic Index	23
Specific Gravity	2.650			Moisture Content	22.8%
Coarse Sand	2.9%	Medium Sand	11.2%	Fine Sand	24.0%

Description of Sand & Gravel Particles: Rounded ☐ Angular ☒
Hard & Durable ☒ Soft ☐ Weathered & Friable ☐

Notes / Deviations / References:

Brian Vaughan, P.E.		Group Leader	4/12/17
Technical Responsibility	*Signature*	*Position*	*Date*

Form No. TR-D698-2
Revision No. : 0
Revision Date: 11/21/07

Moisture - Density Report

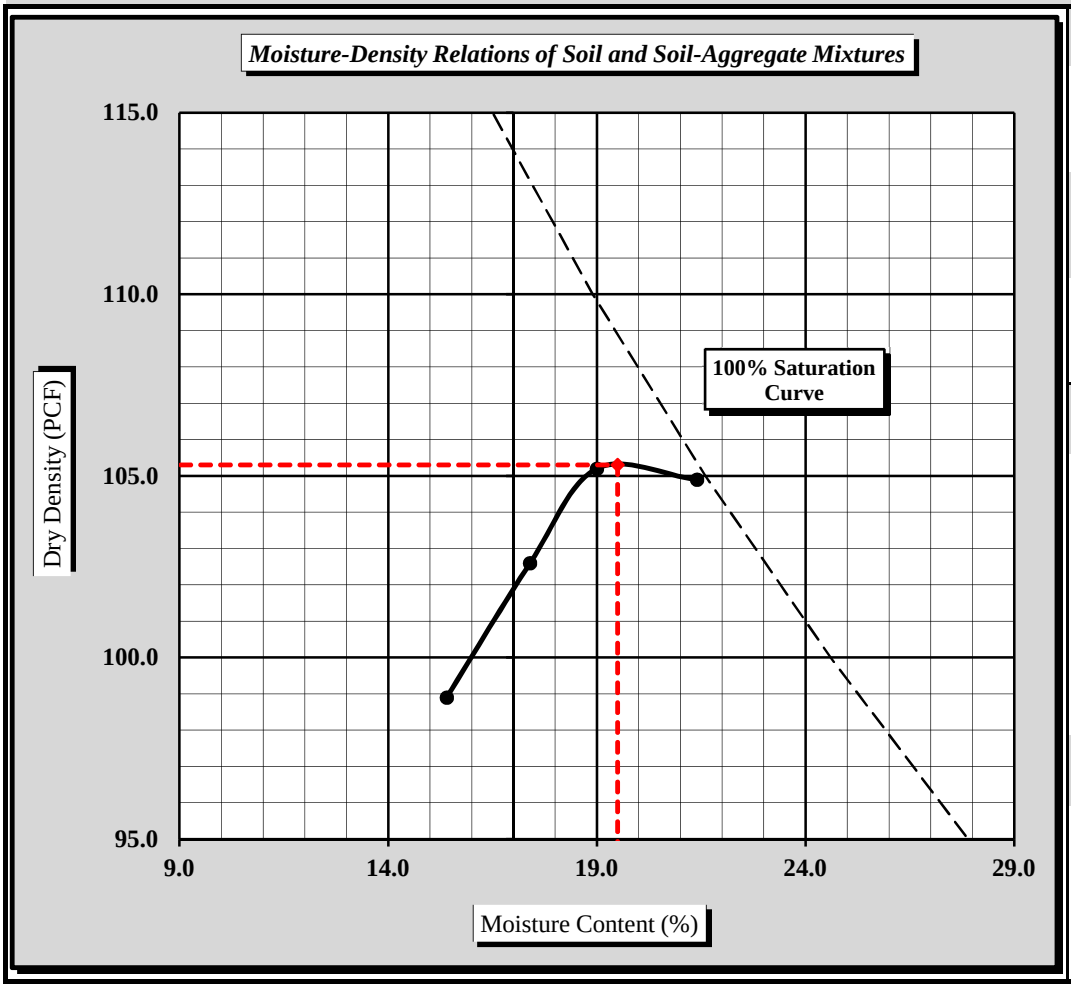
Quality Assurance

S&ME, Inc. - Greenville 48 Brookfield Oaks Dr., Suite F Greenville, SC 29607

S&ME Project #:	**1461-17-025**			Report Date:	4/12/17
Project Name:	City of Newberry Recreation Complex			Test Date:	4/06/17
Client Name:	Alliance Consulting Engineers				
Client Address:	P.O. Box 8147, Columbia, SC				
Boring #:	B-8 thru B-12 composite	Log #:	36g	Sample Date:	3/29/17
Location:	pavements	Type:	Bulk	Depth:	0 - 5'
Sample Description:	Sandy Fat Clay (CH)				

Maximum Dry Density **105.3** **PCF.** **Optimum Moisture Content** **19.5%**

ASTM D 698 - - Method A



Soil Properties	
Natural Moisture Content %	**22.8%**
Specific Gravity of Soil (D 854)	**2.650**
Liquid Limit	**52**
Plastic Limit	**29**
Plastic Index	**23**

% Passing	
3/4"	100.0%
3/8"	100.0%
#4	98.6%
#10	95.7%
#40	84.5%
#60	77.3%
#100	68.7%
#200	60.5%

Oversize Fraction

Bulk Gravity
% Moisture
% Oversize
MDD
Opt. MC

Moisture-Density Curve Displayed: Fine Fraction ☒ Corrected for Oversize Fraction (ASTM D 4718) ☐

Sieve Size used to separate the Oversize Fraction: #4 Sieve ☒ 3/8 inch Sieve ☐ 3/4 inch Sieve ☐

Mechanical Rammer ☐ Manual Rammer ☒ Moist Preparation ☐ Dry Preparation ☒

References / Comments / Deviations:

ASTM D 2216: Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass
ASTM D 698: Laboratory Compaction Characteristics of Soil Using Standard Effort

Brian Vaughan, P.E.		Group Leader	4/12/17
Technical Responsibility	*Signature*	*Position*	*Date*

Form No. TR-D1883-T193-3
Revision No. 1
Revision Date: 9/29/08

CBR (California Bearing Ratio) of Laboratory Compacted Soil

ASTM D 1883

Quality Assurance

S&ME, Inc. - Greenville 48 Brookfield Oaks Dr., Suite F Greenville, SC 29607

Project #:	**1461-17-025**	Report Date:	4/11/17
Project Name:	City of Newberry Recreation Complex	Test Date(s)	4/07 - 4/11/17
Client Name:	Alliance Consulting Engineers		
Client Address:	P.O. Box 8147, Columbia, SC		

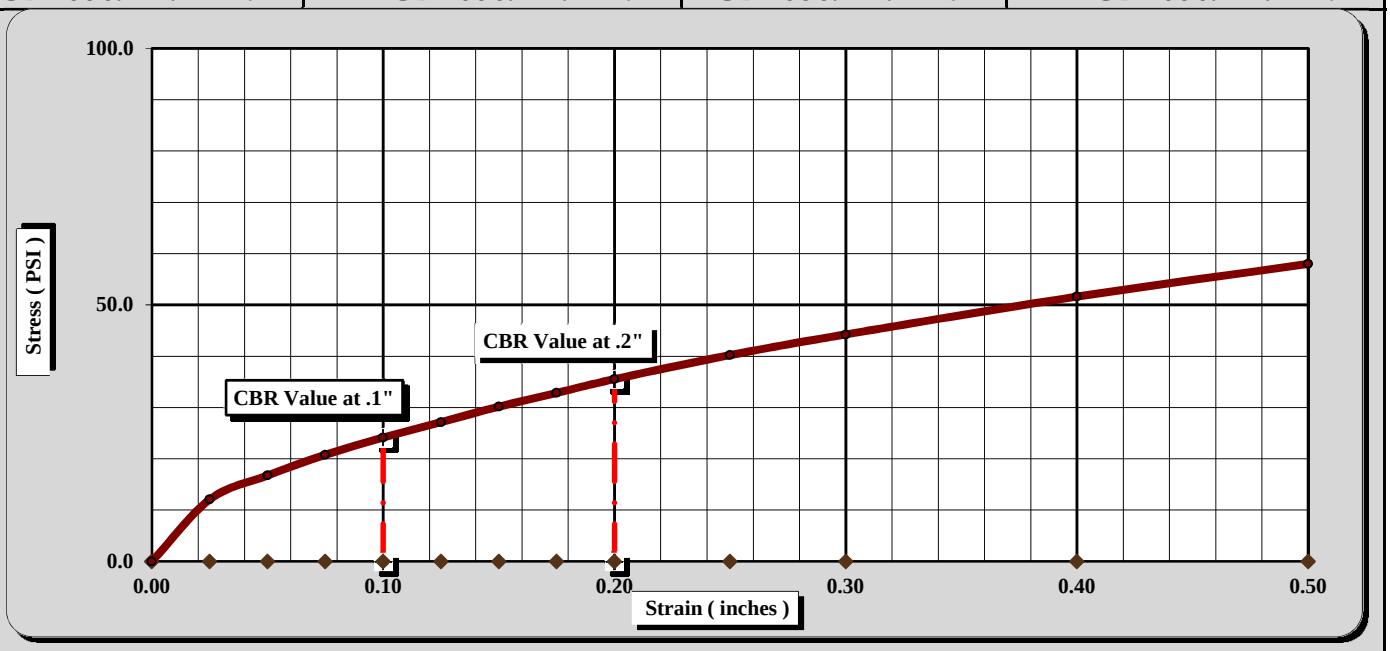
Boring #:	B-8 thru B-12 composite	Log #:	36g	Sample Date:	3/29/17
Location:	pavements	Type:	Bulk	Depth:	0 - 5'

Sample Description: Sandy Fat Clay (CH)

ASTM D 698 ***Method A*** Maximum Dry Density: **105.3 PCF** Optimum Moisture Content: **19.5%**

Compaction Test performed on grading complying with CBR spec. % Retained on the 3/4" sieve: **0.0%**

Uncorrected CBR Values		Corrected CBR Values	
CBR at 0.1 in. 2.4	**CBR at 0.2 in. 2.4**	**CBR at 0.1 in. 2.4**	**CBR at 0.2 in. 2.4**



CBR Sample Preparation:

The entire gradation was used and compacted in a 6" CBR mold in accordance with ASTM D1883, Section 6.1.1

Before Soaking		*After Soaking*	
Compactive Effort (Blows per Layer)	15	Final Dry Density (PCF)	87.0
Initial Dry Density (PCF)	94.8	Average Final Moisture Content	26.8%
Moisture Content of the Compacted Specimen	19.5%	Moisture Content (top 1" after soaking)	31.7%
Percent Compaction	90.0%	Percent Swell	2.7%

Soak Time:	96 hrs.	Surcharge Weight	10.0	Surcharge Wt. per sq. Ft.	50.9
Liquid Limit	52	Plastic Index	23	Apparent Relative Density	2.650

Notes/Deviations/References: Liquid Limit: ASTM D 4318, Specific Gravity: ASTM D 854, Classification: ASTM D 2487

Brian Vaughan, P.E.		Group Leader	4/11/17
Technical Responsibility	*Signature*	*Position*	*Date*

Form No. TR-D1883-T193-3
Revision No. 1
Revision Date: 9/29/08

CBR (California Bearing Ratio) of Laboratory Compacted Soil

ASTM D 1883

Quality Assurance

S&ME, Inc. - Greenville 48 Brookfield Oaks Dr., Suite F Greenville, SC 29607

Project #:	**1461-17-025**	Report Date:	4/11/17
Project Name:	City of Newberry Recreation Complex	Test Date(s)	4/07 - 4/11/17
Client Name:	Alliance Consulting Engineers		
Client Address:	P.O. Box 8147, Columbia, SC		

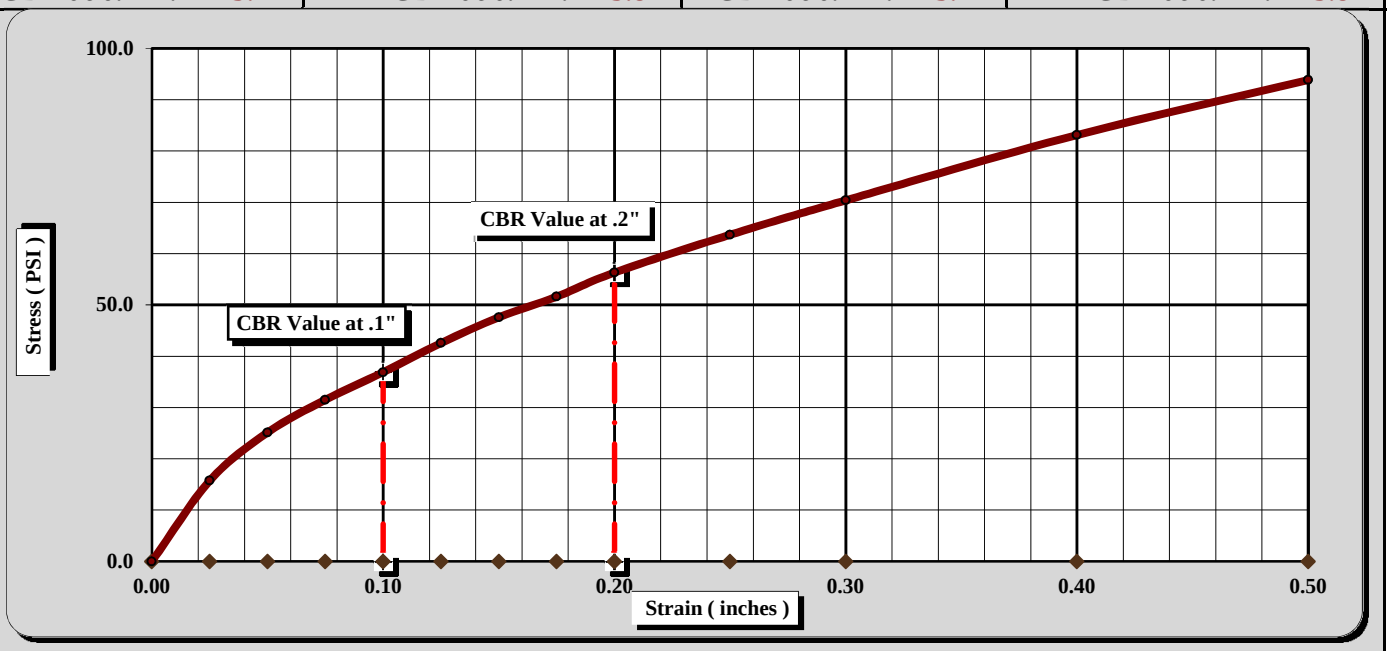
Boring #:	B-8 thru B-12 composite	Log #:	36g	Sample Date:	3/29/17
Location:	pavements	Type:	Bulk	Depth:	0 - 5'

Sample Description: Sandy Fat Clay (CH)

ASTM D 698 *Method A* Maximum Dry Density: **105.3 PCF** Optimum Moisture Content: **19.5%**

Compaction Test performed on grading complying with CBR spec. % Retained on the 3/4" sieve: **0.0%**

Uncorrected CBR Values		Corrected CBR Values	
CBR at 0.1 in. 3.7	**CBR at 0.2 in. 3.8**	**CBR at 0.1 in. 3.7**	**CBR at 0.2 in. 3.8**



CBR Sample Preparation:

The entire gradation was used and compacted in a 6" CBR mold in accordance with ASTM D1883, Section 6.1.1

Before Soaking		*After Soaking*	
Compactive Effort (Blows per Layer)	25	Final Dry Density (PCF)	94.2
Initial Dry Density (PCF)	100.0	Average Final Moisture Content	24.8%
Moisture Content of the Compacted Specimen	19.5%	Moisture Content (top 1" after soaking)	28.9%
Percent Compaction	95.0%	Percent Swell	1.8%

Soak Time:	96 hrs.	Surcharge Weight	10.0	Surcharge Wt. per sq. Ft.	50.9
Liquid Limit	52	Plastic Index	23	Apparent Relative Density	2.650

Notes/Deviations/References: Liquid Limit: ASTM D 4318, Specific Gravity: ASTM D 854, Classification: ASTM D 2487

Brian Vaughan, P.E.	Brian Vaughan	Group Leader	4/11/17
Technical Responsibility	*Signature*	*Position*	*Date*

Form No. TR-D1883-T193-3
Revision No. 1
Revision Date: 9/29/08

CBR (California Bearing Ratio) of Laboratory Compacted Soil

ASTM D 1883

Quality Assurance

S&ME, Inc. - Greenville 48 Brookfield Oaks Dr., Suite F Greenville, SC 29607

Project #:	**1461-17-025**	Report Date:	4/11/17
Project Name:	City of Newberry Recreation Complex	Test Date(s)	4/07 - 4/11/17
Client Name:	Alliance Consulting Engineers		
Client Address:	P.O. Box 8147, Columbia, SC		

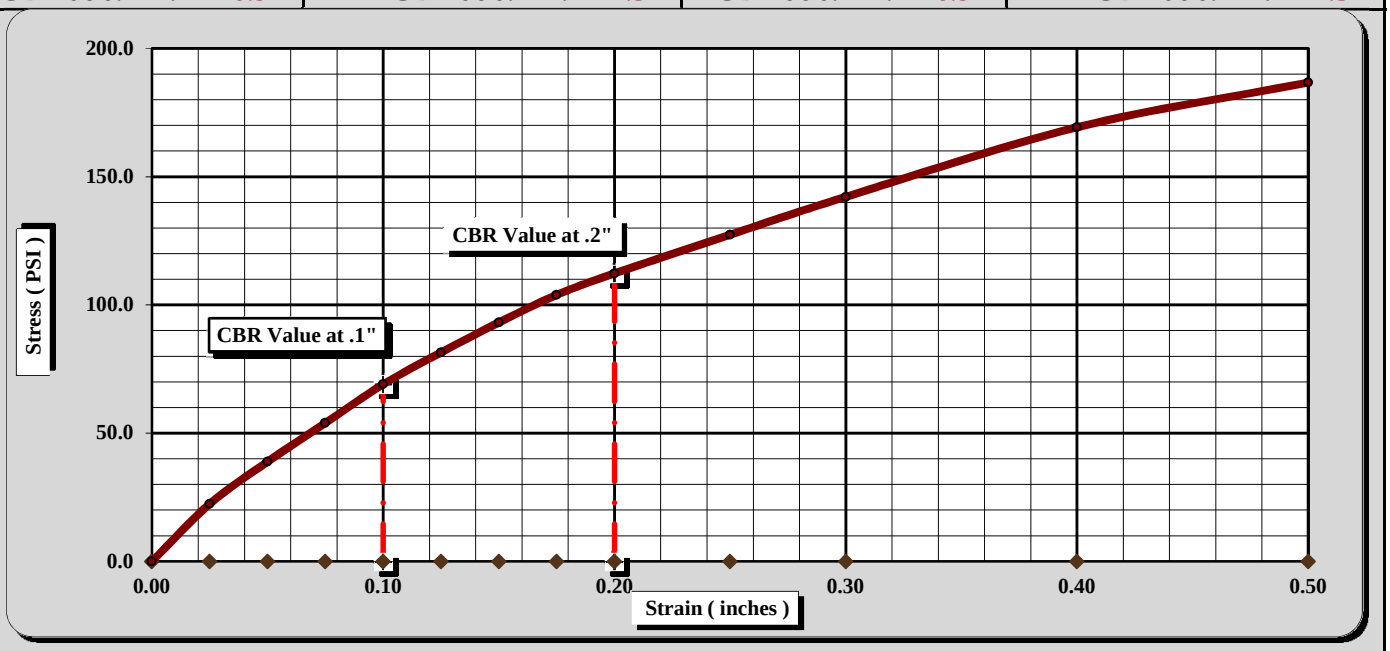
Boring #:	B-8 thru B-12 composite	Log #:	36g	Sample Date:	3/29/17
Location:	pavements	Type:	Bulk	Depth:	0 - 5'

Sample Description: Sandy Fat Clay (CH)

ASTM D 698 ***Method A*** Maximum Dry Density: **105.3 PCF** Optimum Moisture Content: **19.5%**

Compaction Test performed on grading complying with CBR spec. % Retained on the 3/4" sieve: **0.0%**

Uncorrected CBR Values		Corrected CBR Values	
CBR at 0.1 in. 6.9	**CBR at 0.2 in. 7.5**	**CBR at 0.1 in. 6.9**	**CBR at 0.2 in. 7.5**



CBR Sample Preparation:

The entire gradation was used and compacted in a 6" CBR mold in accordance with ASTM D1883, Section 6.1.1

Before Soaking		*After Soaking*	
Compactive Effort (Blows per Layer)	56	Final Dry Density (PCF)	103.5
Initial Dry Density (PCF)	105.3	Average Final Moisture Content	20.1%
Moisture Content of the Compacted Specimen	19.5%	Moisture Content (top 1" after soaking)	27.0%
Percent Compaction	100.0%	Percent Swell	1.4%

Soak Time:	96 hrs.	Surcharge Weight	10.0	Surcharge Wt. per sq. Ft.	50.9
Liquid Limit	52	Plastic Index	23	Apparent Relative Density	2.650

Notes/Deviations/References: Liquid Limit: ASTM D 4318, Specific Gravity: ASTM D 854, Classification: ASTM D 2487

Brian Vaughan, P.E.	Brian Vaughan	Group Leader	4/11/17
Technical Responsibility	*Signature*	*Position*	*Date*

Summary of Laboratory Procedures

❖ Laboratory Tests of Soil

Examination of Split Spoon Soil Samples

Soil and rock samples and field boring records were reviewed in the laboratory by the geotechnical engineer. Soils were classified in general accordance with the visual-manual method described in ASTM D 2488, *Standard Practice for Description and Identification of Soils (Visual-Manual Method)*. The geotechnical engineer also prepared the final boring records enclosed with this report.

Moisture Content Testing of Soil Samples by Oven Drying

Moisture content was determined in general conformance with the methods outlined in ASTM D2216, "Standard Test Method for Laboratory Determination of Water (Moisture) Content of Soil or Rock by Mass." This method is limited in scope to Group B, C, or D samples of earth materials which do not contain appreciable amounts of organic material, soluble solids such as salt or reactive solids such as cement. This method is also limited to samples which do not contain contamination.

A representative portion of the soil was divided from the sample using one of the methods described in Section 9 of ASTM D2216. The split portion was then placed in a drying oven and heated to approximately 110 degrees C overnight or until a constant mass was achieved after repetitive weighing. The moisture content of the soil was then computed as the mass of water removed from the sample by drying, divided by the mass of the sample dry, times 100 percent. No attempt was made to exclude any particular particle size from the portion split from the sample.

Liquid and Plastic Limits Testing

Atterberg limits of the soils was determined generally following the methods described by ASTM D4318, *Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils*. Albert Atterberg originally defined "limits of consistency" of fine grained soils in terms of their relative ease of deformation at various moisture contents. In current engineering usage, the liquid limit of a soil is defined as the moisture content, in percent, marking the upper limit of viscous flow and the boundary with a semi-liquid state. The plastic limit defines the lower limit of plastic behavior, above which a soil behaves plastically below which it retains its shape upon drying. The plasticity index (PI) is the range of water content over which a soil behaves plastically. Numerically, the PI is the difference between liquid limit and plastic limit values.

Representative portions of fine grained Group A, B, C, or D samples were prepared using the wet method described in Section 10.1 of ASTM D4318. The liquid limit of each sample was determined using the multipoint method (Method A) described in Section 11. The liquid limit is by definition the moisture content where 25 drops of a hand operated liquid limit device are required to close a standard width groove cut in a soil sample placed in the device. After each test, the moisture content of the sample was adjusted and the sample replaced in the device. The test was repeated to provide a minimum of three

widely spaced combinations of N versus moisture content. When plotted on semilog paper, the liquid limit moisture content was determined by straight line interpolation between the data points at N equals 25 blows.

The plastic limit was determined using the procedure described in Section 17 of ASTM D4318. A selected portion of the soil used in the liquid limit test was kneaded and rolled by hand until it could no longer be rolled to a 3.2 mm thread on a glass plate. This procedure was repeated until at least 6 grams of material was accumulated, at which point the moisture content was determined using the methods described in ASTM D2216.

Grain Size Analysis of Samples

The distribution of particle sizes greater than 75 µm was determined in general accordance with the procedures described by ASTM D421, *Standard Practice for Dry Preparation of Soil Samples for Particle-Size Analysis and Determination of Soil Constants*, and D422, *Standard Test Method for Particle Size Analysis of Soils*. During preparation samples were divided into two portions. The material coarser than the No. 30 U.S. sieve size fraction was dry sieved through a nest of standard sieves as described in Article 6. Material passing the No. 30 sieve was independently passed through a nest of sieves down to the No. 200 size.

Compaction Tests of Soils Using Standard Effort

Soil placed as engineering fill is compacted to a dense state to obtain satisfactory engineering properties. Laboratory compaction tests provide the basis for determining the percent compaction and water content needed to achieve the required engineering properties, and for controlling construction to assure the required compaction and water contents are achieved. Test procedures generally followed those described by ASTM D698, *Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 lbf/ft3)*.

The relationship between water content and the dry unit weight is determined for soils compacted in either 4 or 6 inch diameter molds with a 5.5 lbf rammer dropped from a height of 12 inches, producing a compactive effort of 12,400 lbf/ft3. ASTM D 698 provides three alternative procedures depending on material gradation:

Method A (Shall be used if 20 percent or less by weight is retained on No. 4 sieve)

- All material passes No. 4 sieve size
- 4 inch diameter mold
- Soil in 3 layers with 25 blows per layer

Method B (Shall be used if 20 percent by weight is retained on the No. 4 sieve and 20 percent or less by weight is retained on the 3/8-inch sieve)

- All material passes 3/8 inch sieve
- 4 inch diameter mold
- Soil in 3 layers with 25 blows per layer

Method C (Shall be used if more than 20 percent by weight is retained on the 3/8-inch sieve and less than 30 percent is retained on the 3/4-inch sieve)

- All material passes ¾ inch sieve
- 6-inch diameter mold
- Soil in 3 layers with 56 blows per layer

Soil was compacted in the mold in three layers of approximately equal thickness, each compacted with either 25 or 56 blows of the rammer. After compaction of the sample in the mold, the resulting dry density and moisture content was determined and the procedure repeated. Separate soils were used for each sample point, adjusting the moisture content of the soil as described in Section 10.2 (Moist Preparation Method). The procedure was repeated for a sufficient number of water content values to allow the dry density vs. water content values to be plotted and the maximum dry density and optimum moisture content to be determined from the resulting curvilinear relationship.

Laboratory California Bearing Ratio Tests of Compacted Samples

This method is used to evaluate the potential strength of subgrade, subbase, and base course material, including recycled materials, for use in road and airfield pavements. Laboratory CBR tests were run in general accordance with the procedures laid out in ASTM D1883, *Standard Test Method for CBR (California Bearing Ratio) of Laboratory Compacted Soils*. Specimens were prepared in standard molds using three different levels of compactive effort within plus or minus 0.5 percent of the optimum moisture content value. While embedded in the compaction mold, each sample was inundated for a minimum period of 96 hours to achieve saturation. During inundation the specimen was surcharged by a weight approximating the anticipated weight of the pavement and base course layers. After removing the sample from the soaking bath, the soil was then sheared by jacking a piston having a cross sectional area of 3 square inches into the end surface of the specimen. The piston was jacked 0.5 inches into the specimen at a constant rate of 0.05 inches per minute.

The CBR is defined as the load required to penetrate a material to a predetermined depth, compared to the load required to penetrate a standard sample of crushed stone to the same depth. The CBR value was usually based on the load ratio for a penetration of 0.10 inches, after correcting the load-deflection curves for surface irregularities or upward concavity. However, where the calculated CBR for a penetration of 0.20 inches was greater than the result obtained for a penetration of 0.01 inches, the test was repeated by reversing the specimen and shearing the opposite end surface. Where the second test indicated a greater CBR at 0.20 inches penetration, the CBR for 0.20 inches penetration was used.

SECTION 03 30 00

CAST IN PLACE CONCRETE

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Concrete formwork.

B. Elevated concrete slabs.

C. Floors and slabs on grade.

D. Concrete shear walls, elevator shaft walls, and foundation walls.

E. Concrete foundations for water storage tank(s).

F. Concrete reinforcement.

G. Joint devices associated with concrete work.

H. Miscellaneous concrete elements, including equipment pads, light pole bases, flagpole bases, thrust blocks, and manholes.

I. Concrete curing.

J. Provide cast-in-place concrete, including formwork and reinforcement, where shown on the Drawings, as specified herein, and as needed for a complete and proper installation.

1.02 RELATED SECTIONS

A. Documents affecting work of this Section include, but are not necessarily limited to, General Conditions, and Sections in Division 01 of these Specifications.

1.03 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Submit manufacturers' data on manufactured products showing compliance with specified requirements.

C. Samples: Submit samples of under slab vapor retarder to be used.

D. Samples: Submit two, 12-inch long samples of waterstops and construction joint devices.

E. Manufacturer's Installation Instructions: Indicate installation procedures and interface required with adjacent construction for concrete accessories.

F. Project Record Documents: Accurately record actual locations of embedded utilities and components that will be concealed from view upon completion of concrete work.

G. Within fifteen (15) calendar days after receiving the Owner's Notice to Proceed, submit proposed mix designs for approval.

1. Proportions shall be determined by means of laboratory tests of concrete made with the cement and aggregate proposed for use.

2. Provide report in detail from an approved testing laboratory showing 7-day and 28-day strengths obtained using materials proposed.

3. Required average strength above specified strength:

   a. Determinations of required average strength above specified strength (f'c) shall be in accordance with ACI 318 and ACI 301.

   b. Establish the required average strength of the design mix using the materials proposed to be employed. Standard deviations shall be determined by thirty tests. Average strength used for selecting proportions shall exceed specified strength (f'c) by at least:

      1) 400 psi Standard deviation is less than 300
      2) 550 psi Standard deviation is 300 to 400
      3) 700 psi Standard deviation is 400 to 500
      4) 900 psi Standard deviation is 500 to 600
      5) 1,200 psi Standard deviation is above 600 or unknown

   c. When the ready-mix producer does not have a record of past performance, the combination of materials and the proportions selected shall be selected from trial mixes having proportions and consistencies suitable for the work using at least three (3) different water/cement ratios which will produce a range of strengths encompassing those required. Average strength required shall be 1,200 psi above specified strength.

4. Cost of this work shall be borne by the Contractor.

A. Manufacturer's data: Submit manufacturer's specification with application instructions for proprietary materials and items, including curing compound, form release agents, admixtures, patching compounds, and others as required by the Engineer.

B. Shop drawings: Submit the following shop drawings to the Engineer for approval before work is started:

1. Reinforcing steel drawings: Prepare in accordance with ACI 315. Indicate bending diagrams, assembly diagrams, splicing and laps of bars, dimensions and details of bar reinforcing and accessories.

2. Cementitious coating.

1.04 QUALITY ASSURANCE

A. Perform work of this section in accordance with ACI 301 and ACI 318.

1. Maintain one copy of each document on site.

B. Acquire cement from same source and aggregate from same source for entire project.

C. Follow recommendations of ACI 305R when concreting during hot weather.

D. Follow recommendations of ACI 306R when concreting during cold weather.

E. Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this Section.

F. Testing agency: A testing laboratory will be retained by the Owner to perform material evaluation tests required by these Specifications.

G. Qualifications of contractors performing concrete work: Minimum of two (2) years' experience on comparable concrete projects.

H. Plant qualification: Plant equipment and facilities shall meet all requirements of the Check List for Certification of Ready Mixed Concrete Production Facilities of the National Ready Mixed Concrete Association and ASTM C94.

1.05 PRODUCT HANDLING

A. Comply with pertinent provisions of Section 01 60 00.

B. Store reinforcement in a manner that will avoid excessive rusting or coating by grease, oil, dirt and other objectionable materials.

C. Keep reinforcement in separate piles or racks so as to avoid loss of identification after bundles are broken.

PART 2 PRODUCTS

2.01 FORMWORK

A. Form Materials: Contractor's choice of standard products with sufficient strength to withstand hydrostatic head without distortion in excess of permitted tolerances.

1. Form Facing for Exposed Finish Concrete: Contractor's choice of materials that will provide smooth, stain-free final appearance.

B. Use form materials conforming to ACI 347.

C. Form lumber: Use lumber of sufficient quality and grade, size and stiffness to adequately support the work and ensure dimensional accuracy.

D. Form ties: Use form ties which do not leave an open hole through the concrete and which permit neat and solid patching at every hole.

1. Use ties with cones that allow a 1" break back and facilitate patching.

2. On structures containing water or other liquid or below grade structures, use embedded rod ties with integral waterstops in addition to cones.

3. Wire ties and wood spreaders will not be permitted.

E. Form coatings: Form release coating shall be neat oil with surface wetting agent or chemical release agent which effectively prevents absorption of moisture, prevents bonding with concrete, is non-staining to concrete and leaves the concrete with a paintable surface.

1. On surfaces to receive an applied coating, use a residual free chemical form release agent which is compatible with the applied coating and will not prevent the applied finish from satisfactorily bonding to the concrete.

2. Chamfer strips: Chamfer strips shall be wood or polyvinyl strips or approved equal, designed to be nailed in the forms to provide a 3/4" chamfer (unless indicated otherwise) at all exposed edges and corners of concrete members.

2.02 REINFORCEMENT

A. Comply with the following as minimums:

1. Bars: ASTM A615, Grade 60, unless otherwise shown on the Drawings, using deformed bars for Number 3 and larger.

   a. Welded wire fabric: ASTM A185.

      1) Use sheet (mat) welded wire fabric only.

      2) Welded wire fabric supplied in rolls will not be accepted.

   b. Bending: ACI 315 and ACI 318.

2. Fabricate reinforcement to the required shapes and dimensions, within fabrication tolerances stated in the CR "Manual of Standard Practices".

3. Do not use reinforcement having any of the following defects:

   a. Bar lengths, depths, or bends exceeding the specified fabricating tolerances.

   b. Bends or kinks not indicated on the Drawings or required for this Work.

   c. Bars with excessive rust, scale, dirt, oil or other defects which will reduce the bond or the effective cross section of the bar.

4. Furnish all support bars, tie bars, chairs, bolsters, etc. required for properly supporting and spacing bars in the forms.

   a. For slabs on grade, use supports with stand plates or horizontal runners where wetted base materials will not support chair legs. Other supports must be approved by the Engineer.

   b. For exposed-to-view concrete surfaces, where legs of supports are in contact with forms, provide supports with legs which are hot-dip galvanized, plastic protected or stainless steel.

   c. Supply supports for welded wire fabric as follows:

Welded Wire (Diameter)	Welded Wire Spacing (inches)	Max. Support Spacing (feet)
W9 or Larger	12 and Greater	4
W5 to W8	12 and Greater	3
W9 and Larger	Less than 12	3
W4 to W8	Less than 12	2
Less than W4	Less than 12	1.5

5. Tie wire: FS QQ-W-461, annealed steel, black, 16 gauge minimum.

6. Welding electrodes: AWS A5.1, low hydrogen, E70 series.

7. Splice devices: Shall be sized to develop one hundred twenty-five (125%) percent of yield strength of bar.

2.03 CONCRETE MATERIALS

A. Cement: ASTM C 150, Type I - Normal, Type 1-P or Type II, Portland type low alkali.

1. Where concrete will be exposed to sewage, use Type II or I-P cement.

2. Fly ash shall conform to ASTM C618, Class C or F.

3. Fly ash content shall not exceed 20% by weight of the total amount of cementitious materials (Portland cement plus fly ash).

B. Fine and Coarse Aggregates: ASTM C 33, Coarse, use No. 57 aggregates.

C. Lightweight Aggregate: ASTM C 330.

D. Calcined Pozzolan: ASTM C 618, Class N.

E. Silica Fume: ASTM C 1240, proportioned in accordance with ACI 211.1.

F. Water: Clean and not detrimental to concrete.

G. Fiber Reinforcement: 1/2 inch length.

1. Use fiber reinforcing where indicated on the drawings.

2. Provide polypropylene or co-polymer fibers as manufactured by High Tech Fibers, Inc., Fibermesh Company or an approved equal.

3. Where required, use fiber reinforcing at a rate of 2.0 lbs. per cubic yard unless another rate is indicated on the drawings.

2.04 CHEMICAL ADMIXTURES

A. Do not use chemicals that will result in soluble chloride ions in excess of 0.1 percent by weight of cement.

B. Water reducing, set controlling admixture: Conform to ASTM C494.

1. Type A - water reducing.

2. Type D - water reducing and retarding.

C. Superplasticizers: Conform to ASTM C494, Types F and G.

1. Use superplasticizers in thin section placements and in areas of congested reinforcing and/or embedded items, or where otherwise approved by the Engineer.

2. Use where conventional consolidation techniques are impractical.

D. Do not use admixtures containing calcium chloride.

2.05 ACCESSORY MATERIALS

A. Under slab Vapor Retarder: Multi-layer, fabric-, cord-, grid-, or aluminum-reinforced polyethylene or equivalent, complying with ASTM E 1745, Class A; stated by manufacturer as suitable for installation in contact with soil or granular fill under concrete slabs. Single ply polyethylene is prohibited.

B. Curing compounds:

1. On all vertical and formed surfaces, construction joints, basin slabs, surfaces to receive an applied coating or finish, and other surfaces except as otherwise indicated or specified, use a non-residual, non-staining curing compound conforming to ASTM C309 Type 1 and 1D. Acceptable products are:

a. L&M Cure W by L&M Construction Chemicals, Inc. (Interior Application). For exterior use L&M Cure W-2.

b. Clear Gaured Core & seal, Clear Seal Standard by A.C. Horn Company, Butterfield Color.

c. Kure 200W by Sonneborn, Inc.

d. Engineer Approved equal.

2. On building floor slabs not otherwise receiving an applied coating or finish and on other flatwork as indicated on the Drawings, provide an acrylic copolymer curing and sealing compound conforming to ASTM C309 Type 1 and the following:

a. Non-yellowing.

b. Minimum 20% solids.

c. Maximum unit moisture loss in accordance with ASTM C156 - 0.40 kg./sq.m at 72 hours.

d. Acceptable products are Dress & Seal by L&M Construction Chemicals, Inc., Clear Seal Standard by A.C. Horn Company, Kure-N-Seal by Sonneborn, Inc., or Engineer approved equal.

2.06 CONCRETE MIX DESIGN

A. Proportioning Normal Weight Concrete: Comply with ACI 211.1 recommendations.

B. Proportioning Structural Lightweight Concrete: Comply with ACI 211.2 recommendations.

C. Concrete Strength: Establish required average strength for each type of concrete on the basis of field experience or trial mixtures, as specified in ACI 301.

1. For trial mixtures method, employ independent testing agency acceptable to Engineer for preparing and reporting proposed mix designs.

D. Admixtures: Add acceptable admixtures as recommended in ACI 211.1 and at rates recommended by manufacturer.

E. Fiber Reinforcement: Add to mix at rate of 1.5 pounds per cubic yard (0.89 kg per cubic meter), or as recommended by manufacturer for specific project conditions.

F. Provide concrete with the compressive strengths shown on the Drawings. When such strengths are not shown on the Drawings, provide the following 28-day strengths as minimum:

1. All structural concrete except as indicated in Nos. 2 and 3 below 4,000 psi or as noted otherwise on the plans.

2. All sidewalks, curbs and gutters, and unreinforced foundations 3,000 psi.

3. Thrust blocking, backfill or encasement for piping, and concrete fill 2,500 psi.

4. Prestressed or precast concrete, 5,000 psi.

G. Maximum water cement ratios:

1. 4000 psi concrete 0.5

2. 3000 psi concrete 0.53

3. 2500 psi concrete 0.67

H. Entrained air:

1. 3000 and 4000 psi concrete 5% (Maximum 1% Difference)

2. 2500 psi concrete Not Required

I. Slump:

1. 3000 and 4000 psi concrete 4" (Maximum 1" Difference)

2. 2500 psi concrete 5" (Maximum 1" Difference)

2.07 MIXING

A. On Project Site: Mix in drum type batch mixer, complying with ASTM C 685. Mix each batch not less than 1-1/2 minutes and not more than 5 minutes.

B. Transit Mixers: Comply with ASTM C 94/C 94M.

2.08 PRODUCTION OF CONCRETE

A. General: Concrete shall be ready mixed and shall be batched, mixed and transported in accordance with ASTM C94 except as otherwise indicated.

B. Monitor time and mix proportions by plant delivery slips.

C. Air entraining admixtures: Add air entraining admixture into the mixture as a solution and measure by means of an approved mechanical dispensing device.

D. Water reducing and retarding admixture: Add water reducing and retarding admixture and measure as recommended by the manufacturer.

E. Addition of water to the mix upon arrival at the job site shall not exceed that necessary to compensate for a 1" loss in slump, nor shall the design maximum water-cement ratio be exceeded. Water shall not be added to the batch at any later time.

F. Weather conditions: Control temperature of mix as required by ACI 306 "Cold Weather Concreting" and by ACI 305 "Hot Weather Concreting".

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify lines, levels, and dimensions before proceeding with work of this section.

3.02 PREPARATION

A. Formwork: Comply with requirements of ACI 301. Design and fabricate forms to support all applied loads until concrete is cured, and for easy removal without damage to concrete.

B. Verify that forms are clean and free of rust before applying release agent.

C. Coordinate placement of embedded items with erection of concrete formwork and placement of form accessories.

D. Where new concrete is to be bonded to previously placed concrete, prepare existing surface by cleaning with steel brush and applying bonding agent in accordance with manufacturer's instructions.

E. In locations where new concrete is doweled to existing work, drill holes in existing concrete, insert steel dowels and pack solid with non-shrink grout.

F. Install vapor retarder under interior slabs on grade. Lap joints minimum 6 inches (150 mm) and seal watertight by taping edges and ends. Cover with sand to depth shown on drawings; repair damaged vapor retarder before covering.

3.03 SURFACE CONDITIONS

A. Examine the areas and conditions under which work of this Section will be performed. Correct conditions detrimental to timely and proper completion of the Work. Do not proceed until unsatisfactory conditions are corrected.

B. Water, mud, organic, and other detrimental material shall be removed from excavations before concrete is deposited.

C. Notify the Engineer prior to placing concrete and place no concrete until the formwork, reinforcing and embedded items have been observed by the Engineer.

3.04 FORMWORK

A. General:

1. Construct forms in conformance with ACI 347.

2. Design, erect, support, brace and maintain formwork so it will safely support vertical and lateral loads which might be applied until such loads can be supported safely by the concrete structure.

3. Construct forms to the exact sizes, shapes, lines and dimensions shown, and as required to obtain accurate alignment, location, grades, level and plumb work in the finished structure.

4. Provide formwork sufficiently tight to prevent leakage of cement paste during concrete placement. Solidly butt joints and provide backup material at joints as required to prevent leakage and prevent fins.

B. Form construction and erection:

1. Construct forms in conformance with ACI 347.

2. Provide for openings, offsets, keyways, recesses, moldings, reglets, chamfers, blocking, screeds, bulkheads, anchorages, inserts and other embedded items as required.

3. Hold inner and outer forms for vertical concrete together with combination steel ties and spreaders approved by the Engineer.

4. Unless specifically stated otherwise, provide 3/4" chamfer at all exposed edges of concrete.

5. Provide temporary openings in the formwork where necessary to facilitate cleaning and inspection of the formwork.

6. Coat form contact surfaces with approved form coating compound prior to placing reinforcing steel.

7. Do not allow excess form coating material to accumulate in the forms or to come in contact with reinforcing surfaces which will bond to fresh concrete.

8. Side forms for footings may be omitted, and concrete may be placed directly against excavation only when requested by the Contractor and approved by the Engineer.

9. Provide a positive means of adjustment of shores and struts and ensure that all settlement is taken up during concrete placing.

10. Construct blockouts and formed openings of sufficient size and proper location to permit final alignment of items within it or passing through it.

a. Allow sufficient space for grouting, packing or sealing around any items penetrating the opening as may be required to ensure watertightness.

b. Provide openings with continuous keyways with waterstops where required, and provide a slight flare to facilitate grouting and the escape of entrapped air during grouting.

c. Provide only blockouts or openings that are shown on the drawings or otherwise approved by the Engineer.

C. Formwork reuse: Reuse only forms that are in good condition and which maintain a uniform surface texture on expose concrete surfaces.

1. Apply a light sanding as necessary to obtain a uniform texture.

2. Plug unused tie holes and penetrations flush with the form surface.

D. Removal of forms:

1. Do not disturb or remove forms until the concrete has hardened sufficiently to permit form removal with complete safety. Do not remove shoring until the member has acquired sufficient strength to support its own weight, the load upon it, and the added load of construction.

2. Do not remove forms before the following minimum times without prior approval from the Engineer:

a.	Sides of footings or slabs on grade	24 hrs
b.	Walls not supporting load	48 hrs
c.	Vertical sides of beams	48 hrs
d.	Columns not supporting load	48 hrs
e.	Suspended slabs or beam bottoms (forms only)	10 days

4. In determining the minimum stripping times, consider only the cumulative time during which the ambient temperature of the air surrounding the concrete is above 50º.

5. Do not remove shoring for suspended slabs or beams until the concrete has reached 75% of the specified 28 day strength.

6. When reshoring or backshoring is permitted or required, plan the operations in advance and submit procedures to the Engineer for approval.

a. Design and plan all reshoring operations to support all construction loading and in accordance with ACI 347.

7. Exercise care in removing forms from finished concrete surfaces so that surfaces are not marred or gouged and that corners are true, sharp and unbroken.

8. Do not permit steel spreaders, form ties, or other metal to project from or be visible on any concrete surface except where so shown on the drawings.

9. Whenever the formwork is removed during the curing period, continue to cure the exposed concrete by one of the methods specified herein.

3.05 EMBEDDED ITEMS

A. Embedded items: Set anchor bolts and other embedded items accurately and securely in position in the forms until the concrete is placed and set.

1. Use templates where practical for all anchor bolts.

2. Check locations of all anchor bolt and special castings prior to placing concrete and verify locations after concreting.

B. Piping cast in concrete:

1. Install and secure sleeves, wall pipes and pipe penetrations before placing concrete.

2. Do not weld or otherwise attach piping to reinforcing steel.

3. Support piping to be encased in concrete securely and on firm foundation so as to prevent movement or settlement during concreting.

C. Locate electrical conduit so that it will not impair the strength of the construction.

1. Do not use conduits running within (not passing through) a slab, wall or beam that are larger in outside diameter than 1/3 overall concrete thickness unless otherwise approved by the Engineer.

2. Do not space conduits closer than three conduit diameters apart unless otherwise approved by the Engineer.

3.06 INSTALLING REINFORCEMENT

A. Fabricate and handle epoxy-coated reinforcing in accordance with ASTM D 3963/D 3963M.

B. Comply with requirements of ACI 301. Clean reinforcement of loose rust and mill scale, and accurately position, support, and secure in place to achieve not less than minimum concrete coverage required for protection.

C. Verify that anchors, seats, plates, reinforcement and other items to be cast into concrete are accurately placed, positioned securely, and will not interfere with concrete placement.

D. General: Comply with the specified codes and standards and Concrete Reinforcing Steel Institute's recommended practice for "Placing Reinforcing Bars" for details and methods of reinforcement placement and supports and as herein specified.

1. Clean reinforcement and remove loose dust and mill scale, earth, and other materials which reduce or destroy bond with concrete.

2. Position and secure reinforcement against displacement by forms, construction, and the concrete placement operations.

3. Use adequate number of ties to secure reinforcing.

4. Do not weld or field bend reinforcing without prior approval by the Engineer.

E. Placing reinforcing:

1. Provide and install all chairs, runners, bolsters, standees and other accessories in sufficient quantities to satisfactorily position the reinforcing and hold it in place during concrete placement.

2. Support reinforcing for slabs on ground on chairs or bolsters with stand plates or a properly sized concrete cube.

a. Use concrete bricks as supports only as approved by the Engineer.

3. Secure and tie dowels in place prior to placing concrete. Do not press dowels into wet concrete.

F. Concrete cover: Unless otherwise indicated on the drawings or specified herein, install reinforcing with clear concrete coverage in conformance with ACI 318.

1. All reinforcement, regardless of size, exposed to water or sewage shall have 2" cover.

2. Place reinforcement a minimum of 2" clear of any openings or metal pipe or fittings.

G. Splicing reinforcement: Splice reinforcement steel in accordance with the latest revisions of ACI 318 "Building Code Requirements for Reinforced Concrete" unless shown otherwise on the drawings.

1. All splices at wall corners or intersections and at wall and foundation intersections shall be Class B tension splices.

2. All other splices of vertical or horizontal steel in walls shall be Class B tension splices as per ACI 318. Horizontal ring steel in circular, non-prestressed concrete tanks shall be Class B tension splices and the splices shall be staggered so that no more than 50% of the bars are spliced at any one location.

3. All welded or mechanical splicing devices shall develop 125% of the yield strength of the bar.

4. Column vertical bars shall lap 30 bar diameters with dowels at the base of the column unless otherwise noted. Dowels shall be the same size and quantity as column vertical bars unless otherwise noted.

5. All splices not otherwise shown or specified shall be Class B tension lap splices.

H. Tolerances: Place bars in the locations indicated within the tolerances conforming to the CRSI "Manual of Standard Practice".

I. Welded wire mesh: Install welded wire fabric in as long of a length as practicable and lay flat before placing concrete.

1. Use only mat welded wire fabric. Do not use welded wire fabric from rolls.

2. Support and tie mesh to prevent movement during concrete placement.

3. Lap adjoining pieces at least one full mesh and lace splices with wire.

4. Provide, at a minimum, supports for welded wire fabric according to the Table in Section 2.2.D.3. Confirm the adequacy of the support spacings listed therein for the anticipated construction loads. Increase the number of supports, if necessary, to assure that the final position of the welded wire fabric will conform to that shown on the drawings.

5. Do not place welded wire fabric on the subbase surface and then hook or "pull up" the reinforcement during concrete placement.

6. Do not lay welded wire fabric on top of the freshly placed concrete and then "walk it" into place.

3.07 PLACING CONCRETE

A. Preparation:

1. Remove foreign matter accumulated in the forms.

2. Rigidly close openings left in the formwork.

3. Wet wood forms sufficiently to tighten up cracks. Wet other material sufficiently to maintain workability of the concrete.

4. Use only clean tools.

5. Provide and maintain sufficient tools and equipment on hand to facilitate uninterrupted placement of the concrete.

6. Before commencing concrete, inspect and complete installation of formwork, reinforcing steel and all items to be embedded or cast-in.

B. Place concrete in accordance with ACI 304R.

C. Notify Engineer not less than 24 hours prior to commencement of placement operations.

D. Install joint devices in accordance with manufacturer's instructions.

E. Maintain records of concrete placement. Record date, location, quantity, air temperature, and test samples taken.

F. Place concrete continuously between predetermined expansion, control, and construction joints.

G. Do not interrupt successive placement; do not permit cold joints to occur.

H. Saw cut joints within 24 hours after placing. Use 3/16 inch thick blade, cut into 1/4 depth of slab thickness.

I. Conveying:

1. Transport and handle concrete from the truck to the place of final deposit as rapidly as practicable by methods which will prevent segregation or loss of ingredients to maintain the quality of the concrete.

2. Provide equipment for lifting, dumping, chuting, pumping or conveying the concrete, of such size and design as to ensure a practically continuous flow of concrete at the delivery and without separation of materials.

3. Use hopers and elephant trunks where necessary to prevent the free fall of concrete for more than 4'.

4. Do not use concrete that is not placed within 1-1/2 hours after water is first introduced into the mix unless the slump is such that it meets the specified limits without the addition of water to the batch.

J. Placing:

1. Deposit concrete as nearly as practicable in its final location so as to avoid separation due to rehandling and flowing.

2. Deposit concrete in horizontal layers not deeper than 2', avoiding inclined layers.

3. Place concrete at such a manner that concrete upon which fresh concrete is deposited is still plastic.

4. Bring slab surfaces to the correct level with screeds set to the proper elevation.

K. Hot weather placement: Place concrete in hot weather in accordance with ACI 305 "Hot Weather Concreting" and as specified herein.

1. Do not place concrete whose temperature exceeds 100ºF.

2. Thoroughly wet forms and reinforcing prior to placement of concrete.

3. Use additional set retarder as necessary to increase set time.

4. Limit the size of the pour where it may reduce the likelihood of cold joints due to reduced set time.

5. Shade the fresh concrete as soon as possible after placing.

6. Start curing as soon as the concrete is sufficiently hard to permit without damage.

L. Cold weather placement: Place concrete in cold weather in accordance with ACI 306 and as specified herein.

1. Except when authorized specifically by the Engineer, do not place concrete when the atmospheric temperature is below 40ºF.

2. When cold weather placement is approved by the Engineer, heat either the mixing water or aggregate or both so that the concrete temperature is between 65ºF and 85ºF.

3. Protect the freshly placed concrete by adequate housing or covering and provide heat to maintain a temperature of not less than 50ºF for not less than four days.

4. Do not add salts, chemicals, or other materials to the concrete mix to lower the freezing point of the concrete.

M. Consolidation:

1. Consolidate each layer of concrete immediately after placing, by use of internal concrete vibrators supplemented by hand spading, rodding, or tamping.

a. Use vibrators having a 2" head diameter and a minimum frequency of 8000 vibrations per second.

b. Provide sufficient number of vibrators to properly consolidate the concrete, keeping up with placement operations.

c. Provide at least one spare vibrator on site.

2. Insert and withdraw vibrators at points approximately 18" apart.

3. Do not vibrate forms or reinforcement.

4. Do not use vibrators to transport concrete inside the forms.

3.08 FINISHING CONCRETE

A. Finish schedule: Unless otherwise indicated on the drawings, finish all concrete surfaces in accordance with the following schedule:

1. Form finish: Formed surfaces not ordinarily exposed to view, including:

a. Interior walls of open tanks below a line one foot lower than the lowest normal water level.

b. The underside of slabs not exposed to view.

c. Walls below grade.

2. Cementitious coating: All formed surfaces exposed to view including:

a. Interior walls of tanks above a line one foot lower than the lowest normal water level.

b. The underside of slabs, soffits, etc. exposed to view.

3. Float finish: Slab surfaces not exposed to view or not receiving an applied thin finish, including:

a. Bottom slabs of tanks or structures containing water sewage or other liquid.

b. Foundations not exposed to view.

c. Roof slabs to be covered with insulation and/or built-up roofing.

4. Trowel finish: Interior slab surfaces exposed to view or to receive an applied thin film coating or floor finish, including:

a. Interior, indoor slabs and floors of buildings.

b. Surfaces on which mechanical equipment moves.

c. Floors receiving vinyl tile, resilient flooring carpet, paint, etc.

5. Broom finish: Exterior, outdoor slabs exposed to view including:

a. Outdoor floor slabs and walkways.

b. Other floors which may become wet or otherwise require a non-skid surface.

c. Sidewalks and concrete pavements.

6. Scratch finish: Surfaces which are to receive a thick topping or additional concrete cast against them including:

a. Surfaces receiving concrete equipment pads.

b. Floors receiving concrete topping.

c. Construction joints not otherwise keyed.

7. Edge finish: Exposed edges of slabs not receiving chamfer including:

a. Sidewalk edges and joints.

b. Pavement edges and joints.

c. Other slab edges not chamfered.

B. Finishing procedures:

1. Form finish:

a. Repair defective concrete.

b. Fill depressions deeper than 1/4".

c. Fill tie holes.

d. Remove fins exceeding 1/8" in height.

2. Cementitious finish:

a. Patch all tie holes and defects and remove all fins.

b. Within one day of form removal, fill all bug holes, wet the surfaces and rub with carborundum brick until a uniform color and texture are produced; or

c. Dampen surfaces, brush apply a grout slurry consisting of 1 part Portland cement to 1-1/2 parts sand, and rub the surface vigorously with a stone. Remove all excess grout.

d. Provide a two coat cement base waterproofing, sealing finish of Thoroseal and Thoroseal Plaster Mix manufactured by Standard Dry Wall Products, Inc. or an approved equal.

1) Patch all tie holes and defects and removal all fins, and clean surface of all dirt, laitance, grease, form treatments, curing compounds, etc.

2) Key coat: Apply key coat of Thoroseal at a rate of two (2) lbs. per sq. yd. by fiber brush. Mix material using one part of Acryl 60 to three parts clean water. Should material start to drag during application, dampen surface with water. During hot weather periods, dampen surfaces with water prior to application of key

coat material. Key coat shall be allowed to cure for five (5) days before applying finish coat.

3) Apply a finish coat consisting of a four (4) to six (6) lbs. per sq. yd. application of Thoroseal Plaster Mix using steel trowel or spray gun. Color to be selected by the Owner. Mix dry material using one (1) part Acryl 60 to three (3) parts clean water. Firmly press the mix into all voids and level with a steel trowel. When surface is set so that it will not roll or lift, float it uniformly using a sponge float.

3. Float finish:

a. Begin floating when the water sheen has disappeared and when the surface has stiffened sufficiently to permit the operation.

b. Cut down all high spots and fill all low spots and float the slab to a uniform sandy texture.

4. Trowel finish:

a. Float finish as specified herein.

b. Power trowel to a smooth surface free of defects.

c. After the surface has hardened sufficiently, hand trowel until a ringing sound is produced as the trowel is moved over the concrete surface.

5. Broom finish:

a. Float finish as specified herein.

b. Provide a scored texture by drawing a broom across the surface.

6. Scratch surface:

a. Screed the surface to the proper elevations.

b. Roughen with rakes or stiff brushes.

7. Edge finish:

a. Tool slab edges and joints with a 1/4" radius edging tool.

3.09 CURING AND PROTECTION

A. Comply with requirements of ACI 308. Immediately after placement, protect concrete from premature drying, excessively hot or cold temperatures, and mechanical injury.

B. Formed Surfaces: Cure by moist curing with forms in place for full curing period.

C. Surfaces Not in Contact with Forms:

1. Start initial curing as soon as free water has disappeared and before surface is dry. Keep continuously moist for not less than three days by water ponding, water-saturated sand, water-fog spray, or saturated burlap.

2. Begin final curing after initial curing but before surface is dry.

   a. Moisture-retaining cover: Seal in place with waterproof tape or adhesive.

   b. Curing compound: Apply in two coats at right angles, using application rate recommended by manufacturer.

D. Protect the surface finish of newly placed concrete from damage by rainwater or construction traffic.

E. Do not apply design loads to structures until the concrete has obtained the specified strength.

1. Do not backfill against walls until they have reached the specified strength and all supporting or bracing walls, slabs, etc. have also reached the specified strength, unless otherwise permitted by the Engineer.

2. Protect structures from construction overloads.

F. Beginning immediately after placement, protect concrete from premature drying, excessively hot and cold temperatures and mechanical injury.

G. Continuously cure concrete for a period of not less than seven (7) days after placement.

1. When seven-day cylinder breaks indicate, in the opinion of the Engineer, the possibility of low strength concrete, provide additional curing as per the request of the Engineer.

2. When temperatures during the curing period fall below 40ºF, provide additional curing time as directed by the Engineer.

H. Unless otherwise directed by the Engineer, cure concrete not in contact with forms in accordance with one of the following procedures:

1. Ponding or sprinkling: Keep entire concrete surface wet by continuously sprinkling or by allowing water to pond, covering all surfaces.

2. Wet burlap: Thoroughly wet and cover all concrete surfaces with wet burlap mats as soon as the concrete has set sufficiently to avoid marring the surface.

   a. Keep the burlap continuously wet during the curing period.

3. Curing blankets: Thoroughly wet concrete surfaces to be cured and cover with curing blankets as soon as the concrete has set sufficiently to avoid marring the surface.

4. Weight the blankets down to maintain close contact with the concrete surface.

   a. Use sheets of waterproof kraft paper with the joints between sheets taped continuously; or

   b. Use sheets of 4 mil or thicker polyethylene with the joints between sheets continuously taped.

5. Wet sand: Apply a layer of sand over the entire surface and keep it continuously wet.

6. Curing compound: Apply curing compound immediately after completion of the finish on uniformed surfaces and within two hours after removal of forms on formed surfaces.

   a. Spray the entire surface with two coats of liquid curing compound, applying the second coat in the direction of 90º to the first coat.

   b. Apply compound in accordance with the manufacturer' instructions to cover the surface with a uniform film which will seal thoroughly.

I. Hot weather: When necessary, provide wind breaks, shading, fog spraying, sprinkling, ponding or wet covering with a light colored material applying as quickly as concrete hardening and finishing operations will allow.

3.10 SURFACE REPAIR

A. Patching mortar:

1. Make a patching mortar consisting of 1 part Portland cement to 2-1/2 parts sand by damp loose volume.

2. Mix the mortar using one part acrylic bonding admixture to two parts water.

B. Tie holes: Clean and dampen all tie holes and fill solidly with patching mortar.

C. Surface defects:

1. Remove all defective concrete down to sound solid concrete.

2. Chip edges perpendicular to the concrete surface or slightly undercut, allowing no feather edges.

3. Dampen surfaces to be patched.

4. Patch defects by filling solidly with repair mortar.

D. Allow the Engineer to observe the work before placing the patching mortar.

E. Repair defective areas greater than 1 sq. ft. or deeper than 1-1/2" as directed by the Engineer using materials approved by the Engineer at no additional expense to the Owner.

3.11 JOINTS

A. Construction joints:

1. Unless otherwise approved by the Engineer, provide construction joints as shown on the drawings.

2. If additional construction joints are found to be required, secure the Engineer's approval of joint design and location prior to start of concrete placement.

3. Continue all reinforcing across construction joints and provide 1-1/2" deep keyways unless indicated otherwise on the drawings.

a. Form keyways in place.

4. Provide waterstops in all construction joints of liquid containing structures, structures below grade or other structures as shown on the drawings.

B. Expansion joints:

1. Provide expansion joints of size, type and locations as shown on the drawings.

2. Do not permit reinforcement or other embedded metal items that are being bonded with concrete (except smooth dowels bonded on only one side of the joints, where indicated on the drawings) to extend continuously through any expansion joint.

3. Provide waterstops where required.

C. Control or contraction joints:

1. Locate and construct control and contraction joints in accordance with the Drawings.

2. Where no specific joint pattern is indicated in slabs on grade or concrete pavements, submit a proposed joint layout to the Engineer for approval.

3. Where no specific joint details are shown on the drawings, joints may be tooled, preformed or saw-cut.

4. Saw-cut joints as soon as the concrete has hardened sufficiently to prevent aggregates from being dislodged by the saw.

3.12 FIELD QUALITY CONTROL

A. An independent testing agency will perform field quality control tests, as specified in Section 01 40 00.

B. Provide free access to concrete operations at project site and cooperate with appointed firm.

C. Submit proposed mix design of each class of concrete to inspection and testing firm for review prior to commencement of concrete operations.

D. Take one additional test cylinder during cold weather concreting, cured on job site under same conditions as concrete it represents.

E. Concrete cylinder tests:

1. During construction, prepare test cylinders for compressive strength testing, using 6" diameter by 12" long single use molds, and complying with ASTM C31.

a. Make a set of three test cylinders from each pour of 50 cubic yards or less, plus one additional set of cylinders for each additional 50 cubic yards or fraction thereof.

b. Identify each and tag cylinder as to date of pour and location of concrete which it represents.

c. Deliver cylinders to testing lab selected by the Owner.

d. Cost for preparation and delivery of cylinders shall be borne by the Contractor. Cost for testing cylinders will be borne by the Owner.

2. Should strengths shown by test cylinders fail to meet specified strengths for the concrete represented, then:

a. Engineer shall have the right to require changes in the mix proportions as he deems necessary on the remainder of the work.

b. Additional curing of those portions of the structure represented by the failed test cylinders shall be accomplished as directed by the Engineer.

c. Upon failure of the additional curing to bring the concrete up to specified strength requirements, strengthening or replacement of those portions of the structure shall be as directed by the Engineer.

d. The Engineer may require additional testing of concrete in question by either non-destructive methods such as the Swiss Hammer, Windsor Probe or Ultrasonics or by coring and testing the concrete in question in accordance with ASTM C42. Such testing shall be performed at no additional cost to the Owner.

F. Other field concrete tests:

1. Slump tests: Either the Engineer or a testing laboratory representative will make slump tests of concrete as it is discharged from the mixer.

a. Slump test may be made on any concrete batch at the discretion of the Engineer.

b. Failure to meet specified slump requirements (prior to addition of any superplasticizers) will be cause for rejection of the concrete.

2. Temperature: The concrete temperature may be checked at the discretion of the Engineer.

3. Entrained air: Air content of the concrete will be checked by a representative of the testing laboratory at the discretion of the Engineer.

G. Coordination of laboratory services: The Contractor shall be responsible for coordination of laboratory services.

1. Maintain a log recording quantities of each type of concrete placed, date and location of pour.

2. Inform the testing laboratory of locations and dates of concrete placement and other information as required to be identified in the laboratory's test reports.

H. Tests required because of extensive honeycombing, poor consolidation of the concrete or any suspected deficiency in the concrete will be paid for by the Contractor.

I. Dimensional tolerances:

1. Dimensional tolerances for allowable variations from dimensions or locations of concrete work, including the locations of embedded items shall be as given in ACI 301.

2. Where anchor bolts or other embedded items are required for equipment installation, comply with the manufacturer's tolerances if more stringent than those stated in ACI 301.

J. Watertight concrete:

1. All liquid containing structures, basements or pits below grade shall be watertight.

2. Any visible leakage or seepage shall be repaired as instructed by the Engineer at no expense to the Owner.

3. Where physical evidence of honeycombing, cold joints or other deficiencies which may impair the watertightness of a structure exists, the Engineer may at his discretion call for leak testing of the structure.

a. Fill the structure with water and allow to stand for not less than 48 hours.

b. Make repairs on the structure until all visible leaks are sealed and the leakage rate of the water in the structure is less than 0.1% of the volume held in the structure per day.

c. The cost of testing and repairs shall be performed at no expense to the Owner.

K. Concrete which fails to meet strength requirements, dimensional tolerances, watertightness criteria, or is otherwise deficient due to insufficient curing, improper consolidation or physical damage shall be replaced or repaired as instructed by the Engineer at no expense to the Owner.

3.13 DEFECTIVE CONCRETE

A. Test Results: The testing agency shall report test results in writing to Engineer and Contractor within 24 hours of test.

B. Defective Concrete: Concrete not conforming to required lines, details, dimensions, tolerances or specified requirements.

C. Repair or replacement of defective concrete will be determined by the Engineer. The cost of additional testing shall be borne by Contractor when defective concrete is identified.

D. Do not patch, fill, touch-up, repair, or replace exposed concrete except upon express direction of Engineer for each individual area.

END OF SECTION

SECTION 03 40 00

PRECAST CONCRETE

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Lintels and bond beams.

B. Manholes

C. Utility Vaults

D. Headwalls

1.02 RELATED SECTIONS

A. 03 30 00 - Cast-In Place Concrete

1.03 REFERENCES

A. ACI 318 - Building Code Requirements for Reinforced Concrete and Commentary; American Concrete Institute International; 2014.

B. ASTM A 36/A 36M - Standard Specification for Carbon Structural Steel; 1997a.

C. ASTM A 153/A 153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 1998.

D. ASTM A 185 - Standard Specification for Steel Welded Wire Fabric, Plain, for Concrete Reinforcement; 1997.

E. ASTM A 416/A 416M - Standard Specification for Steel Strand, Uncoated Seven-Wire for Prestressed Concrete; 1998.

F. ASTM A 497 - Standard Specification for Steel Welded Wire Fabric, Deformed, for Concrete Reinforcement; 1997

G. ASTM A 615/A 615M - Standard Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement; 1996a.

H. ASTM A 666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar; 1999.

I. ASTM A 767/A 767M - Standard Specification for Zinc-Coated (Galvanized) Steel Bars for Concrete Reinforcement; 1997.

J. ASTM C 150 - Standard Specification for Portland Cement; 1999a.

K. AWS D1.1 - Structural Welding Code - Steel; American Welding Society; 2000.

L. AWS D1.4 - Structural Welding Code - Reinforcing Steel; American Welding Society; 1998.

M. PCI MNL-116S - Manual for Quality Control for Plants and Production of Precast and Prestressed Concrete Products; Precast/Prestressed Concrete Institute; 2013, Tenth Edition.

N. PCI MNL-120 - PCI Design Handbook - Precast and Prestressed Concrete; Precast/Prestressed Concrete Institute; 1999.

O. PCI MNL-123 - Design and Typical Details of Connections for Precast and Prestressed Concrete; Precast/Prestressed Concrete Institute; 1988, Second Edition.

1.04 DESIGN REQUIREMENTS

A. Size components to withstand design loads in a restrained condition as follows:

1. Horizontal Assembly: 150 psf live and dead loads.

2. Vertical Assembly: 20 psf wind load.

3. As shown on the drawings.

B. Maximum Allowable Deflection: 1/180 span.

C. Design members exposed to the weather to provide for movement of components without damage, failure of joint seals, undue stress on fasteners or other detrimental effects, when subject to seasonal or cyclic day/night temperature ranges.

D. Design system to accommodate construction tolerances, deflection of other building structural members and clearances of intended openings.

1.05 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Indicate standard component configurations, design loads, deflections, cambers, and bearing requirements.

C. Shop Drawings: Indicate layout, unit locations, fabrication details, unit identification marks, reinforcement, connection details, support items, dimensions, openings, and relationship to adjacent materials. Indicate design loads, deflections, cambers, bearing requirements, and special conditions.

D. Samples: Submit two panels, 24 x 24 inch (610 x 610 mm) in size, illustrating surface finish treatment.

E. Design Data: Submit design data reports indicating calculations for loadings and stresses of fabricated, designed framing.

1.06 QUALITY ASSURANCE

A. Perform work of this section in accordance with requirements of PCI MNL-116S, PCI MNL-120, and PCI MNL-123.

B. Fabricator Qualifications: Company specializing in manufacturing products specified in this section, with not less than three years of documented experience.

C. Erector Qualifications: Company specializing in erecting products of this section with minimum five (5) years of documented experience.

D. Design precast concrete members under direct supervision of a Professional Structural Engineer experienced in design of precast concrete and licensed in the State of South Carolina.

E. Welder: Qualified within previous 12 months in accordance with AWS D1.1 and AWS D1.4.

1.07 REGULATORY REQUIREMENTS

Conform to ACI 318 for design load and construction requirements applicable to work of this section.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Handle precast members in position consistent with their shape and design. Lift and support only from support points.

B. Lifting or Handling Devices: Capable of supporting member in positions anticipated during manufacture, storage, transportation, and erection.

C. Protect members to prevent staining, chipping, or spalling of concrete.

D. Mark each member with date of production and final position in structure.

1.09 PROJECT/SITE CONDITIONS

Coordinate the work of framing components not pre-tensioned but associated with the work of this section.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Precast Concrete:

1. Sherman Precast.

2. Tindall Concrete Products.

3. Hanson

4. Approved Equal.

2.02 MATERIALS

A. Cement: White Portland, conforming to ASTM C 150, Type I.

B. Aggregate, Sand, Water, Admixtures: Determined by precast fabricator as appropriate to design requirements and PCI MNL-116S.

2.03 REINFORCEMENT

A. Tensioning Steel Tendons: ASTM A 416/A 416M, Grade 250 (1725); seven-wire stranded steel cable; low-relaxation type; full length without splices; uncoated.

B. Reinforcing Steel: ASTM A 615/A 615M Grade 60 (420).

1. Plain billet-steel bars.

2. Unfinished.

3. Shop fabricated and bent cold.

C. Welded Steel Wire Fabric: ASTM A 185 plain type; in flat sheets; unfinished.

2.04 ACCESSORIES

A. Connecting and Supporting Devices: Plates, angles, items cast into concrete, and inserts conforming to PCI MNL-123, and as follows:

1. Material: Carbon steel conforming to ASTM A 36/A 36M.

2. Finish: Prime painted, except where device surfaces will be in contact with concrete or will require field welding.

B. Grout:

1. Non-shrink, non-metallic, minimum yield strength of 10,000 psi (69 MPa) at 28 days.

2. Epoxy.

C. Bearing Pads: High density plastic, Vulcanized elastomeric compound molded to size, Neoprene (Chloroprene), or Tetrafluoroethylene(TFE); Shore A Durometer; 1/8 inch (3 mm) thick, smooth both sides.

D. Bolts, Nuts and Washers: High strength steel type recommended for structural steel joints.

2.05 FABRICATION

A. Fabrication procedure to conform to PCI MNL-116S.

B. Maintain plant records and quality control program during production of precast members. Make records available upon request.

C. Ensure reinforcing steel, anchors, inserts, plates, angles, and other cast-in items are embedded and located as indicated on shop drawings.

D. Tension reinforcement tendons as required to achieve design load criteria.

E. Provide required openings with a dimension larger than 10 inches (250 mm) and embed accessories provided under other sections of the specifications, at indicated locations.

2.06 FINISHES

A. Ensure exposed-to-view finish surfaces of precast concrete members are uniform in color and appearance.

B. Cure members under identical conditions to develop required concrete quality, and minimize appearance blemishes such as non-uniformity, staining, or surface cracking.

C. Architectural Finish: Surface holes or bubbles over 1/4 inch (6 mm) filled with matching cementitious paste, fins or protrusions removed and surface ground smooth.

D. Precast manufacturer shall coat inside of all wet well structures and receiving manholes (manhole force main discharges into) with two-component, self-priming, chemically

cured, coal tar epoxy protective coating. In accordance with Section 09 96 56.

2.07 FABRICATION TOLERANCES

A. Conform to PCI MNL-116S.

B. Maximum Variation From Nominal Dimension: 1 inch (25 mm).

C. Maximum Variation From Intended Camber: 5/8 inch (15 mm).

D. Maximum Out of Square: 1/8 inch/10 feet (3 mm/3 m), non-cumulative.

E. Maximum Misalignment of Anchors, Inserts, Openings: 1/8 inch (3 mm).

F. Maximum Bowing of Members: Length of Bow/ 360.

2.08 SOURCE QUALITY CONTROL AND TESTS

A. Section 01 40 00 - Quality Requirements: Provide mix design for concrete.

B. Test samples in accordance with applicable ASTM standard.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that site conditions are ready to receive work and field measurements are as shown on shop drawings.

3.02 PREPARATION

A. Prepare support equipment for the erection procedure, temporary bracing, and induced loads during erection.

3.03 WETWELLS AND UTILITY VAULTS

A. Concrete bases may be precast or cast-in-place. The concrete base of precast and cast-in-place structures shall be placed on an (eight) 8-inch No. 57 stone mat or as shown on the drawings. Each precast section shall have not more than two holes for the purpose of handling and laying. These holes shall be tapered and shall be plugged with rubber stoppers or mortar installation. Brick or concrete ring to support cover shall be a minimum of 3 inches high but not more than 18 inches high.

B. Openings larger than 1 1/2 inches in diameter shall be precast into the appropriate section.

C. Any openings added during construction shall be approved by the precast manufacturer and be formed by coring. No other method for adding holes will be considered.

D. Joints of the precast sections shall be tongue and groove type. Sections shall be joined using O-ring rubber gaskets conforming to ASTM C443 or preformed mastic sealer. In addition, the joint shall be sealed inside and out with cement mortar using one part Portland cement to two parts clean sand meeting ASTM C144. The joints shall be watertight.

E. Shaped bottoms shall be as shown on the drawings. They shall be constructed of one monolithic pour using 3000-psi concrete.

F. Brickwork required to complete the precast concrete structures shall be constructed using mortar of one part Portland cement to two parts clean sand, meeting ASTM C144 and thoroughly mixed to a workable plastic consistency.

G. Any damage to the coating during storage, handling, transportation or installation of the section shall be repaired immediately to provide complete coverage and protection per manufacturer's recommendations. Mortar joints shall receive two (2) coats of waterproofing after the section is installed and the mortar has set and dried.

3.04 ERECTION

A. Erect members without damage to structural capacity, shape, or finish. Replace or repair damaged members.

B. Align and maintain uniform horizontal and vertical joints, as erection progresses.

C. Maintain temporary bracing in place until final support is provided. Protect members from staining.

D. Provide temporary lateral support to prevent bowing, twisting, or warping of members.

E. Adjust differential camber between precast members to tolerance before final attachment.

F. Install bearing pads.

G. Level differential elevation of adjoining horizontal members with grout to maximum slope of 1:12.

H. Set vertical units dry, without grout, attaining joint dimension with lead or plastic spacers.

I. Grout underside of column bearing plates.

J. Secure units in place. Perform welding in accordance with AWS D1.1.

3.05 ERECTION TOLERANCES

A. Erect members level and plumb within allowable tolerances.

B. Conform to PCI MNL-116S.

C. Design and erect to the following tolerances:

1. Maximum Variation from Plane or Location Indicated on Drawings: 1/4 inch/10 feet and 3/8 inch in 100 feet (6 mm/3 m and 9 mm in 30 mm), non-cumulative.

2. Maximum Offset from True Alignment Between Members: 1/4 inch (6 mm).

3. Maximum Variation From Dimensions Indicated on Reviewed Shop Drawings: Plus or minus 1/8 inch (3 mm).

D. Exposed Joint Dimension: 3/8 inch (9 mm) plus or minus 1/4 inch (6 mm).

E. When members cannot be adjusted to conform to design or tolerance criteria, cease work and advise. Execute modifications as directed.

3.06 PROTECTION

A. Protect members from damage caused by field welding or erection operations.

B. Provide non-combustible shields during welding operations.

3.07 CLEANING

Clean weld marks, dirt, or blemishes from surface of exposed members.

END OF SECTION

SECTION 09 97 23.12

EPOXY LINING FOR WETWELL AND MANHOLE INTERIORS

PART 1 GENERAL

1.01 DESCRIPTION

A. Work included: Provide for all manholes, wetwells, structures, etc. as shown on the drawings, specified herein, and needed for a complete and proper installation.

B. This specification includes the materials and application of a corrosion-resistant, spray-applied, solvent-free epoxy lining to all interior concrete surfaces, and inverts to provide resistance to hydrogen sulfide and acid attack from microbiological sources.

C. Inverts are to be repaired as/if needed before epoxy lining is done. Need to determine manhole by manholes.

1.02 QUALITY ASSURANCE

A. Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this Section.

B. Referenced manufacturer of coating system is Raven Lining Systems, Inc. of Tulsa, OK, and is named to establish standards of quality. Products of other manufacturers complying with these specifications may be provided upon approval by the Engineer.

C. The Contractor and applicable subcontractors must make a pre-bid site visit to visually inspect existing site conditions.

D. All work under this Section is to be performed by personnel qualified and certified by the manufacturer of the products.

E. Applicator Qualifications

1. Provide written certification from the protective coating manufacturer that the Applicator's personnel are trained and approved in the handling, mixing, and application of the products to be used.

2. Provide written certification form the protective coating manufacturer that the equipment to be used for applying the products has been approved and Applicator's personnel have been trained and certified for proper use of the equipment.

3. Five (5) recent references of Applicator (projects of similar size and scope) indicating successful application of a high-build solvent-free epoxy coating by spray application. Provide references upon request.

4. Proof of any necessary federal, state or local permits or licenses necessary for the project.

F. Applicator shall initiate and enforce quality control procedures consistent with applicable ASTM, NACE and SSPC standards and the protective coating manufacturer's recommendations.

G. Warranty: Applicator shall warrant all work against defects in materials and workmanship for a period of five (5) years, unless otherwise noted, from the date of final acceptance of the project. Applicator shall, within a reasonable time after receipt of written notice thereof, repair defects in materials or workmanship which may develop during said five (5) years period, and any damage to other work caused by such defects or the repairing of the same, at his own expense ad without cost to the Owner.

1.03 SUBMITTALS

A. Product data: Within 30 calendar days after the Contractor has received the Owner's Notice to Proceed, submit:

1. Materials list of items proposed to be provided under this Section.

2. Manufacturer's specifications and other data needed to prove compliance with the specified requirements, including ASTM test results.

3. Material safety Data Sheets (MSDS) for each product used.

4. Project specific guidelines and recommendations from the coating manufacturer.

B. Provide written certification from the coating manufacturer regarding personnel performing the work.

1.04 PRODUCT HANDLING

A. Materials are to be kept dry, protected from weather and stored under cover.

B. Protective coating materials are to be stored between 50 degrees F and 90 degrees F. Do not store near flam, heat or strong oxidants.

C. Protective coating materials are to be handled according to their material safety data sheets.

PART 2 PRODUCTS

2.01 GENERAL

A. Provide a leak-resistant lining system consisting of properly prepared substrate, approved repair materials, and solvent-free epoxy coating.

2.02 EXISTING PRODUCTS

A. Standard Portland cement or new concrete must be properly cured for 28 days prior to application of the protective coating.

B. Remove existing coatings prior to application of the new protective coating. Maintain strict adherence to applicable NACE and SSPC recommendations with regard to proper surface preparation and compatibility with existing coatings.

2.03 LINER MATERIALS

A. Infiltration control mix:

1. Provide a rapid setting cementitious product specifically formulated for leak control, used to stop minor water infiltration and mixed and applied according to manufacturer's recommendations and have the following minimum requirements:

a. Compressive Strength (ASTM C109) – 600 psi, 1hr.

b. Bond (ASTM C321) – 40 psi, 4 hrs.

c. Set Time – 60 seconds

2. Acceptable products:

a. Strong-Plug as manufactured by Strong-Seal Systems, Corp.

b. Quad-Plug as manufactured by Quadex, Inc.

B. Chemical grout (leak repair):

1. Provide a polymer solution that reacts freely with water to form a strong film, gel, or foam of polyurethane, designed for stopping very active infiltration.

2. Acceptable product:

a. 920 PrimeFlex as manufactured by Prime Resins, Inc.

C. Underlayment Grout:

1. Provide a quick setting cementitious material, designed to fill large voids and repair or reconstruct inverts, mixed and applied according to manufacturer's recommendations, meeting the following minimum requirements:

a. Compressive Strength (ASTM C109) – 1400 psi, 6 hrs.

b. Flexural Strength (ASTM 348) – 450 psi, 1 hr.

c. Bond (ASTM C321) - >130 psi, 28 days

d. Density, when applied – 105 +/- 5 pcf

2. Acceptable products:

a. QSR as manufactured by Strong-Seal Systems, Corp.

b. Hyperform as manufactured by Quadex, Inc.

D. Cementitious Base (calcium aluminate):

1. Provide a base made with calcium aluminate cement and 100% calcium aluminate aggregate, used to form a structural/structurally enhanced monolithic liner covering all interior manhole surfaces and have the following minimum requirements at 28 days:

a. Compressive Strength (ASTM C109) - >9000 psi

b. Tensile Strength (ASTM C496) - >800 psi

c. Flexural Strength (ASTM C293) - >1200 psi

d. Shrinkage at 90% relative humidity (ASTM C596) – 0%

e. Bond (ASTM C882) - >1600 psi

f. Freeze/Thaw (ASTM C666) – 100 cycles, no damage

2. Acceptable products:

a. Sewper Coat Pumpable Grade as manufactured by LaFarge Calcium Aluminates.

b. Strong Seal High Performance mix as manufactured by Strong-Seal Systems, Corp.

c. Aluminaliner as manufactured by Quadex, Inc.

3. Cementitious application equipment:

a. Used specially designed machines consisting of a 3-stage progressive cavity rotor-stator style pump capable of producing a minimum of 250 psi pumping pressure, a vertical shaft mixer with twin horizontal mixing paddles, and a minimum 12 cfm/90 psi air system for spray application of the mortar for applying cementitious materials. Use equipment that includes a water storage system, and water metering device. Use a hydraulically powered mixer and pump.

b. Use the Quadex SprayMaster or Strong-Seal Spraymate for applying the corrosion resistant cementitious materials.

E. Epoxy liner:

1. Provide a high build solvent-free epoxy coating formulated with high physical strengths and chemical resistance to be applied in a multiple pass application to form a monolithic coating within the structure. Provide a product with the following minimum requirements:

a. Flexural Strength (ASTM D790) - >13,000 psi

b. Compressive Strength (ASTM D695) - >18,000 psi

c. Tensile Strength (ASTM D638) - >7,600 psi

d. Ultimate Elongation (ASTM D638) – 1.50%

e. Hardness (ASTM D2240) – 88

f. Water Vapor Transmission (ASTM D1653) – 3.8 gms/sq.m (24hrs)

g. Adhesion (ASTM D4541) – concrete substrate failure

2. Acceptable Product:

a. Raven 405 as manufactured by Raven Lining Systems.

3. Epoxy application equipment:

a. Used specially designed heated plural component airless spray equipment in the application of the specified coating.

b. The proportioning and dispensing system shall consist of a plural component proportioning pump, plural component heated hose, mix manifold, and an airless spray gun with manufacturer specified tip.

2.04 OTHER MATERIALS

A. Provide other materials, not specifically described but required for a complete and proper installation, as selected by the Contractor subject to the approval of the Engineer.

PART 3 EXECUTION

3.01 BEGINNING WORK

A. Provide all materials, labor, equipment, etc. required to perform Work.

B. Inspect structures to determine methods of leak repairs.

C. Promptly inform Owner of errors or discrepancies found, in order that proper corrections may be made.

D. Follow al manufacturer's instructions regarding surface preparation, product application and curing.

3.02 TEMPERATURE OF WORKING AREA

A. Temperature of working area must be between 35^{O} F and 90^{O} F.

B. Store materials within the 65^{O} F to 80^{O} F range for 48 hours prior to use.

C. Do not apply in direct sunlight or where rising surface temperatures may result in blistering of the materials due to expansion of entrapped air or moisture in the concrete or grout.

D. When the surface temperatures are rising, postpone the application or apply during cooler hours.

3.03 SURFACE PREPARATION

A. New concrete:

1. Concrete must be sufficient strengths to support cured material.

2. Concrete surfaces that have been cured with conventional curing compounds or are contaminated with form oils or grease must be chemically cleaned or scarified to remove the contaminants prior to abrasive blasting or hydroblasting.

3. Suitable finished concrete must have a uniform surface texture, exposing fine aggregate and resembling coarse sandpaper.

a. If surface texture is not uniform in appearance, repeat abrasive blasting or hydroblasting until the desired surface is obtained.

4. After surface preparation, fill all voids with underlayment grout.

B. Existing concrete:

1. Abrasive blast or hydroblast concrete to achieve hard firm surface. Hydroblast using pressure water spray of minimum 5,000 psi at 5 gpm.

2. After blasting, degergent wash to remove remaining oi, grease and other contaminants.

3. Repair all structural defects, voids, or cracks in substrate.

4. Fill in defect voids with underlayment grout.

5. Where necessary to restore the concrete substrate, attach 2” x 2” x 10 or 12 gauge wire mesh to the concrete, then apply the underlayment grout.

C. Brick manholes:

1. Remove all oil, grease, chemicals and paints or protective coatings from the brick by chemical cleaning prior to hydroblasting or abrasive blasting.

2. Abrasive blast or hydroblast surface to achieve hard firm surface. Hydroblast using pressure water spray of minimum of 5000 psi at 5 gpm.

3. After blasting, detergent wash to remove remaining oil, grease and other contaminants.

4. Remove all foreign particles and attacked or unsound mortar from the joints.

5. Regrout loose brickwork with underlayment grout to ensure structural integrity of the manhole.

D. All surfaces must be free of dust, loose particles, oils, grease, chemical contaminants and previously applied paints or protective coatings.

E. All surfaces are to be dry after completion of surface preparation.

3.04 STOPPING ACTIVE LEAKS

A. After surface cleaning, seal all visible leaks with a specified material.

B. Stop minor infiltration control mix.

C. Stop larger leaks using chemical grout.

D. Provide weep holes as required to localize the infiltration during the application. Repair weep holes prior to applying liner coats.

3.05 APPLICATION OF LINER

A. New Concrete:

1. Mix all products in accordance with manufacturer's instructions.

2. Spray-apply the epoxy coating to a minimum thickness of 120 mils.

B. Existing Concrete:

1. Mix all products in accordance with manufacturer's instructions.

2. Spray-apply the calcium aluminate base at a minimum 1/2" thickness.

   a. Trowel and brush finish material immediately following the spray application.

3. Spray-apply the epoxy coating finish over the calcium aluminate base, to a minimum thickness of 120 mils.

C. Brick Surfaces:

1. Mix all products in accordance with manufacturer's instructions.

2. Spray-apply the calcium aluminate base at a minimum of 1-inch thickness.

   a. Trowel and brush finish material immediately following the spray application.

3. Spray-apply the epoxy coating finish over the calcium aluminate base, to a minimum thickness of 120 mils.

3.06 INSPECTION AND TESTING

A. During application, a wet film thickness gage, such as those available through Paul N. Garner Company, Inc. meeting ASTM D4414 – Standard Practice for Measurement of Wet Film Thickness of Organic Coatings by Notched Gages, shall be used to ensure a monolithic coating and uniform thickness during application.

B. Inspect the protective coating after it has set hard to the touch with high voltage holiday detection equipment.

C. Initially set the spark tester at 100 volts per 1 mil (25 microns) of film thickness applied.

D. Mark all detected holidays and repair by abrading the coating surface with a minimum of 60-grit sandpaper or other manufacturer approved hand-tooling method.

E. After abrading and cleaning, hand apply additional protective coatings material to the repair area.

F. All touch-up and repair procedures are to be performed in strict accordance with the protective coating manufacturer's recommendations.

3.07 CLEAN-UP OPERATIONS

A. Use proper procedures for waste disposal of all residues, adhering to manufacturer's recommendations.

B. Disposal to be at a sanitary landfill site or other approved disposal site.

C. All equipment and work areas to be cleaned properly and completely.

D. Failure to maintain work sites properly cleaned up will be sufficient cause for withholding of monthly payments to the Contractor.

3.08 MEASUREMENT AND PAYMENT

A. Payment for all work under this Section will be included in the lump sum bid or the cost of the unit price item to which it is applied.

END OF SECTION

SECTION 11 68 33.33

DUGOUTS

PART 1 GENERAL

1.1 DESCRIPTION

1.1.1 Dugout structure(s) shall be designed to be freestanding, open air pavilion in conformance with all applicable building codes. Manufactured by RCP Shelters or approved equal.

PART 2 PRODUCT

2.1 DESIGN

2.1.1 Shall be RCP Shelters, Inc. model #AS-H1022-04 or approved equal to this specification by the Engineer. Provide six (6) units of this model.

2.1.2 The structure shall be over a 4" minimum thickness reinforced concrete slab. There shall be no center column. The owner or contractor shall be responsible for unloading, temporary storage, soil testing (if necessary), site preparation, concrete slab, and erection of structures. Structure will be designed by a professional, registered engineer.

2.1.3 The shelter shall be a pre-cut and pre-fabricated package that shall include the structural frame, panelized roof, fasteners, and trim and installation drawings. The structure shall be shipped in a knocked down manner for minimum shipping charges.

2.1.4 All structural framing of the dugout shall be structural tube steel with end caps to form a clean, neat appearance and no place for bird nesting or small animals to roost. Since all connections will bolt together, field welding shall not be required. Bolts shall be concealed within the tubing where possible. The steel frame, railings (if applicable), and overhead ornamentation (if applicable) of the dugout shall be prime painted.

2.1.5 The shelter shall be set on prepared footings. Foundation will be constructed to meet local code, the shelter manufacturer's design, and good construction practices for the specific site conditions. The structure shall be attached to the top of the concrete by use of anchor bolts, hidden inside column when possible.

2.1.6 Steel columns and frame to be factory prime painted with a rust inhibitive modified alkyd primer according to Steel Structures Painting Council (SSPC-SP2) as outlined in AISC 6.5. The columns and frame shall be finished painted in the field with a weather resistant paint, supplied and applied by the contractor or owner.

2.1.7 Optional finish paint. The columns and frame shall be factory finish painted with two coats of weather resistant enamel paint.

2.1.8 Optional powder coat. The columns and frame shall receive one coat of zinc rich primer, then top-coated with polyester powder-coating, 4 to 6 mils. The frame shall be packaged in foam, cardboard, and stretch wrap to protect the finish during transit.

2.1.9 Roofing: The roof system shall be 24-gauge galvanized steel 5V panels with 1 3/16" high ribs, 12" on center. It shall be precut into panels 3' wide by the length from the eave to the ridge. Angels shall be factory precut. Matching roof trim and fasteners shall be supplied. Ribs shall run with the pitch of the roof for proper drainage. Hip and ridge beams must have cap plates for metal deck bearing. Metal deck cannot bear on beam corner only. This is structurally unsound and will be rejected. Panels shall be pre-painted with a KYNAR 500 paint system to a color selected by owner from the standard color chart.

2.1.10 Benches: The dugout shall have PVC coated, perforated steel benches. Bench options selected by owner/customer (6' or 8', with or without backs). Members to have rounded edges and fasten from beneath seat surface.

2.2 OPTIONAL EQUIPMENT

2.2.1. **ORNAMENTATION (Optional)** The dugout shall have railings on up to five sides. All railings to be minimum 36" high with plate steel pickets.

2.2.3 **CUPOLA (Optional)** An all steel, louvered cupola shall be included for the peak of the dugout. Cupola to be factory built, assembled, and attached to the compression ring for ease of installation.

3.1 EXECUTION

3.1.1 Install unit in accordance with manufacturer's written instructions and shop drawings.

END OF SECTION

SECTION 13 34 16.53

BLEACHERS

PART 1 GENERAL

1.1 SECTION INCLUDES

1.1.1 Design and fabrication of angle frame bleachers

1.2 QUALITY ASSURANCE

1.2.1 Manufacturer: National Recreation Systems, Inc. (or approved equal - type to be approved by Owner)
5120 Investment Drive, Fort Wayne, In 46858-1487
Phone Number: (888) 568-9064
Email: sales@bleachers.net
Web site: www.bleachers.net

1.2.2 Manufacturer Qualifications: Manufacturer must have a minimum of ten years experience in the design and manufacture of bleachers.

1.2.3 Welders must conform to AWS standards.

1.2.4 Source Quality Control: Mill Test Certification.

1.2.5 Codes and Standards: 2003 International Building Code

1.3 WARRANTY

1.3.1 Warranty shall guarantee bleachers to be free from defect in materials and workmanship for a period of one (1) year under normal use. Warranty period shall begin on date of completion for projects installed by manufacturer, or its subcontractors, or warranty period shall begin on date of final delivery on projects installed by others.

1.3.2 Anodized finish of plank extrusions shall be covered by a 5 year warranty against loss of structural strength or finish deterioration due to exposure to weather conditions or UV rays. Discoloration of mill finish aluminum due to galvanic reaction not covered.

1.4 ENGINEERING

1.4.1 Engineering certifications and calculations by a Registered Professional Engineer will be provided upon request, for a fee.

PART 2 PRODUCTS

2.1 ACCEPTABLE MANUFACTURER

2.1.1 National Recreation Systems, Inc. (888)568-9064 www.bleachers.net email sales@bleachers.net

2.2 DESIGN

2.2.1 Applicable Codes:

INTERNATIONAL BUILDING CODE (IBC), 2003 EDITION

2.2.2 Design Loads:

1. Live Loads: Uniform loading - Structure = 100 psf Uniform loading Seat and Foot plank = 120 plf

2. Sway Loads: Perpendicular to seats = 10 plf Parallel to seats = 24 plf

3. Guardrail Loads: Uniform vertical load = 100 plf Uniform horizontal load = 50 plf Concentrated horizontal load = 200 pounds

4. Wind Loads: Basic design wind speed = 150 mph (exposure “B”)

Note: Bleacher must be anchored to meet wind loads above

2.3 ANGLE FRAME BLEACHERS

2.3.1 Quantity and Size: Shall consist of six (6) model # NB-0521ASTD unit(s) or approved equal, two (2) model # BE-DD21 or approved equal permanent aluminum seating eighteen (18) units of model #BE-DD24 or approved equal.

2.3.2 Framework: Prefabricated aluminum angle or galvanized steel angle at maximum 6' spacing joined by means of aluminum angle cross bracing.

2.3.3 Shop connections: Welded to meet AWS standards and local code requirements

2.3.4 Joint Sleeve Assembly: Internal splices, where required shall be two per joint, and shall penetrate the joint a minimum of 8 in each direction and be riveted at one end only to allow for contraction and expansion.

2.3.5 Rise and Depth Dimensions: 8” vertical rise and 24” tread depth, Seat height is 17” above its respective tread. (Except low rise & 3 row models)

2.3.6 Seats: Nominal 2” x 10” anodized aluminum with anodized end caps.

2.3.7 Treads: Nominal one (1) or optional two (2) 2” x 10” mill finish aluminum with anodized end caps on rows 2 and up.

2.3.8 Risers: Nominal 2” x 10” mill finish aluminum with end caps on top row. Nominal 1” x 6” mill finish aluminum with end caps on all other rows.

2.3.9 Aisles: Aisle footboards shall be of aluminum alloy 6063-T6 and be of mill finish with contrasting aisle markings. Three aisle stiffener angles shall be used to strengthen the aisle step. There shall be _2_ aisle(s) _20_" wide.

2.3.10 Aisle Handrail: Anodized aluminum pipe with intermediate rail.

2.3.11 Guardrail: Rails shall be needed if there are more than 3 rows and will be anodized aluminum tube with end plugs and elbows where required. All Rails shall be secured to support with galvanized fasteners. Top rails at sides, rear and front shall be 42” above the leading edge of seat or walking surfaces. Rear rail support members shall be aluminum channel, side and front rail support s shall be aluminum angle.

1. Chain link System: Fencing shall consist of 9 gauge, 2” mesh galvanized chain link fabric, heavy duty tension bands, tension bars, brace bands, combo rail end caps, and wire ties.

2. Vertical Picket System: Aluminum pipe and bar anodized after fabrication & attached to supports with galvanized fasteners.

2.4 MATERIALS / FINISHES

2.4.1 Framework:

1. Aluminum: Structural fabrication with aluminum alloy 6061-T6 mill finish. Each frame shall be unit-welded, using metal inert gas method, under guidelines by the American Welding Society. Galvanized Steel: ASTM A36/A & A529/A after fabrication all steel is hot dipped galvanized to ASTM A 123 specifications. All cross bracing and horizontal bracing shall be aluminum angle 6061-T6 mill finish.

2.4.2 Extruded Aluminum:

1. Seat planks: Aluminum alloy 6063-T6, clear anodized 204R1, AA-M10C22A31, Class II with a wall thickness nominally .078" for impact and deformation resistance.

2. Tread and Riser Planks: Aluminum alloy 6063-T6, mill finis with a wall thickness nominally .078” for impact and deformation resistance.

3. Guardrail Pipe: 1-5/8 OD schedule 40 aluminum alloy 6105-T5, clear anodized 204R1, AA-M10C22A31, Class II.

4. Handrail Pipe: 1-5/8 OD schedule 40 aluminum alloy 6105-T1, clear anodized 204R1, AA-M10C22A31, Class II.

2.4.3 Accessories:

1. Channel End Caps: Aluminum alloy 6063-T6, clear anodized 204R1, AA-M10C22A31, Class II.

2. Hardware: Bolts and Nuts shall be hot dipped galvanized.

3. Hold Down Clip Assembly: Aluminum alloy 6063-T6 mill finish.

4. Joint Sleeve Assembly: Aluminum alloy 6061-T6, mill finish.

PART 3 EXECUTION

3.1 INSTALLATION

3.1.1 Install bleacher unit in accordance with manufacturer's written instructions and shop drawings.

Note: Building codes may vary from site to site. The customer is responsible for verification of local code requirements.

END OF SECTION

SECTION 22 05 23.14

MISCELLANEOUS VALVES

PART 1 GENERAL

1.01 SCOPE

A. Furnish all labor, materials, equipment and incidentals required to complete and make ready for operation, all valves and appurtenances as shown on the Drawings and as specified herein.

B. This Section does not include valves for combustible or flammable liquids or gases.

C. The equipment shall include, but is not limited to, the following:

1. Reduced Pressure Zone, Backflow Preventer
2. Gate Valves
3. Sewage Swing Check Valves
4. Air Valves
5. Pressure Reducing Valves
6. Valve Operator Accessories
7. Stainless Steel Ball Valves
8. PVC Diaphragm Valves
9. PVC Ball Valves
10. PVC Ball Check Valves
11. PVC Butterfly Valves
12. PVC Swing Check Valves
13. Solenoid Valves
14. Pressure Gauges
15. Strainers
16. Backpressure valves
17. Pressure Relief Valves
18. Calibration Cylinders
19. Pulsation Dampener
20. Diaphragm Isolators
21. Degassing Valves

D. Motorized actuators where required shall be provided by the manufacturer in accordance with Section 22 05 23.15 of these Specifications.

1.02 SUBMITTALS

A. Submit to the Engineer, within 30 days after execution of the Contract, a list of materials to be furnished, the names of the suppliers, and the date of delivery of materials to the site.

B. Complete shop drawings of all valves and appurtenances shall be submitted to the Engineer for approval in accordance with Section 01 30 00 of these Specifications. Clearly indicate make, model, location, type, size and pressure rating.

C. Operating and maintenance data for all valves shall be furnished for each valve.

1.03 STORAGE AND PROTECTION

A. Valves and all associated accessories shall be stored and protected in accordance with the requirements of Section 01 60 00 of these Specifications.

1.04 QUALITY ASSURANCE

A. The manufacturer shall provide written certification to the Engineer that all equipment furnished complies with all applicable requirements of these Specifications.

PART 2 PRODUCTS

A. GENERAL: Provide valves of same manufacturer throughout where possible. Provide valves with manufacturer's name and pressure rating clearly marked on the outside of the valve body. All exposed bolts, nuts, and washers for buried or submerged valves shall be cadmium or zinc plated in accordance with ASTM B 633, Type II unless specified otherwise.

B. SHOP PAINTING: All exterior ferrous metal surfaces of exposed or submerged valves and appurtenances shall receive a coating of rust-inhibitive primer compatible with the finish paint specified in Section 09 90 23.12 of these Specifications. The exterior of all buried valves shall have a factory applied, two coat asphaltic varnish or fusion bonded epoxy coating system. All plug valves shall have a factory applied enamel coating, but a coat of asphaltic varnish may be added in the field. All interior ferrous metal surfaces of 4-inch and larger valves, except for finished or bearing surfaces, and appurtenances shall be provided with one coat, interior epoxy coating conforming to the requirements of AWWA C550 and NSF 61.

2.01 REDUCED PRESSURE ZONE, BACKFLOW PREVENTER

A. The device shall consist of a pressure differential relief valve located in a zone between two positive seating check valves. The relief valve shall contain a separate means whereby free air will enter the zone, and contained water will be discharged to the atmosphere when the valve is fully open. The assembly shall include two tightly closing shut-off valves before and after the device, test cocks, and a strainer. The device shall meet the requirements of AWWA C511, latest revision, UL EX3185, and the SBCCI Plumbing Code.

B. The size shall be as shown on the plans. Size 3 inch and smaller shall have ball valves for shut-off. Size 4 inch and larger shall have OS & Y gate valves for shut-off. A 2-inch diameter bypass line with shut off valve shall be provided for size 4 inches and larger.

C. If intended for below grade service, the backflow preventer shall be installed in a precast or cast-in-place concrete enclosure. The bottom shall have a minimum of four, three-inch

diameter weep holes. The enclosure shall be installed on a minimum of 6 inches of No. 57 stone. An aluminum watertight lid of non-traffic design and a clear opening exceeding the length of the backflow preventer shall be provided.

2.02 GATE VALVES

A. Valves 2”-3” shall be resilient wedge type rated for 250 psig cold water working pressure. All ferrous components shall be ductile iron or cast iron.

B. Valves 4”-16” shall be in full compliance with AWWA C515 or AWWA C509. The words “Ductile Iron” or “Cast Iron” shall be cast on the valve or stamped on a permanently attached corrosion resistant metal tag. The wedge shall be iron encapsulated with nitrile rubber and be symmetrical and seal equally well with flow in either direction. There shall be no exposed metal seams, edges or screws within the waterway.

1. The stem shall be bronze in full compliance with section 4.7 of AWWA C509.

2. Valves shall be NSF Standard 61 certified.

3. Bolting materials shall develop the physical strength requirements of ASTM A307 and may have either regular square or hexagonal heads with dimensions conforming to ANSI B18.2.1. Metric size socket head cap screws therefore are not allowed.

4. Operating nut shall be constructed of ductile iron and shall have four flats at stem connection to assure even input torque to the stem.

5. All gaskets shall be pressure energized O-rings.

6. Stem shall be sealed by three O-rings. The top two O-rings shall be replaceable with valve fully open and while subject to full rated working pressure. O-rings set in a cartridge shall not be allowed.

7. Valve shall have thrust washers located with (1) above and (1) below the thrust collar to assure trouble-free operation of the valve.

8. All internal and external surfaces of the valve body and bonnet shall have a fusion bonded epoxy coating, complying with ANSI/AWWA C550, applied electrostatically prior to assembly, 250# raised face flanges shall be provided when required.

9. Valves shall be American Flow Control, Mueller, Clow, M&H or approved equal.

C. Valve ends shall be mechanical joint type except where flanged or restrained joint ends are shown. Flanged joints shall meet the requirements of ANSI B16.1, Class 125.

D. Operators

1. The direction of opening in all cases shall be counterclockwise, or to the left. The direction of opening shall be clearly marked with the word “OPEN” and an arrow at least two inches long pointing in the direction of “OPEN”. The markings shall appear on the wrench nut base for valves installed below ground and on the handwheel of all valves having handwheels.

2. Manually operated valves, including geared valves, shall be non-rising stem type having O-ring seals.

3. Valves for buried service shall have a nut type operator and shall be equipped with

a valve box and extension stem as specified in this Section unless access to the operator is provided by a manhole.

4. Valves for non-buried service shall be equipped with a handwheel operator. Valves six feet or more above the operating floor shall be equipped with a chainwheel operator and chain for operation from floor level.

5. Valves shall be provided with motorized operators where shown on the Drawings.

2.03 SEWAGE SWING CHECK VALVES

A. Air cushioned check valves shall prevent backflow and be watertight. Valves shall be designed for the operating head indicated and shall not slam shut on pump shutdown. Valves shall be hinged disc type with cast iron body and cover conforming to ASTM A126, Class B and cast or ductile iron disc. The valve shall have a resilient Buna-N rubber disc seat held in place by a stainless steel or bronze follower ring and screws. The body seat shall be stainless steel or bronze and replaceable. The flow area shall be greater than or equal to the nominal inlet size. The shaft shall continuous and stainless steel, extending both sides of the body be and be sealed where it passes through the body to prevent leakage. A lever and an easily moved counterweight shall initiate closure and shall be steel or ductile iron. The external, side mounted, adjustable, air cushion cylinder shall cushion closure of the valve and be corrosion resistant. Valves shall be equipped with a 1/2-inch tap at the high point of the valve for bleeding air from the line.

B. Oil cushioned check valves shall prevent backflow and be watertight. Valves shall be designed for the operating head indicated and shall not slam shut on pump shutdown. Valves shall be hinged disc type with cast iron body and cover conforming to ASTM A126, Class B and cast or ductile iron disc. The valve shall have a resilient Buna-N rubber disc seat held in place by a stainless steel follower ring and screws. The body seat shall be stainless steel and replaceable. The flow area shall be greater than or equal to the nominal inlet size. The shaft shall continuous and stainless steel, extending both sides of the body be and be sealed where it passes through the body to prevent leakage. A lever and an easily moved counterweight shall initiate closure and shall be steel or ductile iron. An oil controlled, side mounted cylinder shall provide two speed control closing for the prevention of surge control and water hammer. Each stage shall be independently adjustable and the oil system will be self-contained and separate from the main line media. Valves shall be equipped with a 1/2-inch tap at the high point of the valve for bleeding air from the line.

C. Valve ends shall be flanged, meeting the requirements of ANSI B16.1, Class 125.

D. Valves shall be manufactured by APCO, GA Industries, Crispin or approved equal.

2.04 AIR VALVES

A. For Sewage Service

1. Air Release Valves: The air release valve shall automatically release air accumulations from the pipeline due to the action of the float and lever mechanism. When the air valve body fills with air, the float falls. Through the leverage mechanism, this causes the resilient seat to open the orifice and allow the air to escape to the atmosphere. When all the air has been exhausted from the valve body, the float will be buoyed up. Through the leverage mechanism, this will cause the resilient seat to close the orifice, preventing water from being exhausted from the valve. The valve body and cover shall be constructed of cast iron conforming to ASTM A 126, Class B. The float shall be constructed of stainless steel and attached to a stainless steel lever mechanism. A resilient, Buna-N seat shall be attached to the lever mechanism for drop-tight closure. The valve shall be equipped with the necessary attachments, including valves, quick disconnect

couplings and hose, to permit back flushing after installation without diverting the valve.

2. Air/Vacuum Valve: The air/vacuum valve shall discharge large amounts of air as the pipeline fills and allow air to enter the pipeline as it drains or in the event of vacuum conditions. The valve body and cover shall be constructed of cast iron conforming to ASTM A 126, Class B. The valve shall operate by means of a non-collapsible stainless steel float which seals an orifice. As air enters the valve the float shall drop from the orifice and allow the air to escape. As water rises in the valve, the float will again seal the orifice. The valve will be of such design that the float cannot blow shut at any air velocity. All working parts shall be of stainless steel. The valve shall be equipped with the necessary attachments, including valves, quick disconnect couplings and hose, to permit back flushing after installation without diverting the valve.

3. Combination Air Valves: Combination air valves shall combine the features of an air release valve and an air/vacuum valve and shall be of one of the following types:

   a. Combination air valves 3 inches and larger shall consist of an air/vacuum valve described in B. above, with an air release valve described in A. above tapped into its body. The valve shall be of two-piece body design with an isolation gate valve separating the two valves.

   b. Combination air valves less than 3 inches shall be single body, double orifice, allowing large volumes of air to escape out the larger diameter air and vacuum orifice when filling a pipeline and closes watertight when the liquid enters the valve. During large orifice closure, the smaller diameter air release orifice will open to allow small pockets of air to escape automatically and independently of the large orifice. The large air/vacuum orifice shall also allow large volumes of air to enter through the orifice during pipeline drainage to break the vacuum. The valve body and cover shall be constructed of cast iron conforming to ASTM A 126, Class B. The Buna-N seats must be fastened to the valve, without distortion, for drop-tight shut-off. The float and other internal metal components shall be stainless steel. The valve shall be equipped with the necessary attachments, including valves, quick disconnect couplings and hose, to permit back flushing after installation without diverting the valve.

4. The valve shall be equipped with the necessary attachments, including valves, quick disconnect couplings and hose, to permit back flushing after installation without diverting the valve.

5. All air valves and accessories shall be supplied by a single manufacturer and shall be GA Industries, APCO Valve Corporation, Crispin, Val-Matic or approved equal.

B. For Water Service

1. Air Release Valves: The air release valve shall automatically release air accumulations from the pipeline due to the action of the float. When the air valve body fills with air, the float falls freely from the orifice to allow the air to escape to the atmosphere. When all the air has been exhausted from the valve body, the float will be buoyed up to seat against the orifice and prevent water from being exhausted from the valve. The valve body and cover shall be constructed of cast iron conforming to ASTM A 126, Class B. A synthetic orifice button shall be affixed to the valve cover to provide a non-corrosive seat for the float. The float shall be constructed of stainless steel. A resilient, Buna-N seat shall be attached to the float for drop-tight closure.

2. Air/Vacuum Valve: The air/vacuum valve shall discharge large amounts of air as the pipeline fills and allow air to enter the pipeline as it drains or in the event of vacuum conditions. The valve body and cover shall be constructed of cast iron conforming to ASTM A 126, Class B. The valve shall operate by means of a non-collapsible stainless steel float and Buna-N seat, which seals an orifice. As air enters the valve the float shall drop from the orifice and allow the air to escape. As water rises in the valve, the float will again seal the orifice. The valve will be of such design that the float cannot blow shut at any air velocity including sonic velocity. All working parts shall be of stainless steel. For valves 3 inches and larger, a surge check shall be installed on the inlet to reduce the flow of extremely high velocity water during closing to minimize slam and shock. The surge check shall have an ASTM A126, Class B cast iron body and bronze internals. For valves smaller than 3 inches, a deep well throttling device shall be incorporated to reduce the flow of extremely high velocity water during closing to minimize slam and shock.

3. Combination Air Valves: Combination air valves shall combine the features of an air release valve and an air/vacuum valve and shall be of one of the following types:

   a. Combination air valves 3 inches and larger shall consist of an air/vacuum valve described in paragraph B. above, with an air release valve described in A. above tapped into its body. The valve shall be of two-piece body design with an isolation gate valve separating the two valves.

   b. Combination air valves smaller than 3 inches shall be single body, double orifice, allowing large volumes of air to escape out the larger diameter air and vacuum orifice when filling a pipeline and closes watertight when the liquid enters the valve. During large orifice closure, the smaller diameter air release orifice will open to allow small pockets of air to escape automatically and independently of the large orifice. The large air/vacuum orifice shall also allow large volumes of air to enter through the orifice during pipeline drainage to break the vacuum. The valve body and cover shall be constructed of cast iron conforming to ASTM A 126, Class B. The Buna-N seats must be fastened to the valve, without distortion, for drop-tight shut-off. The float shall be stainless steel. The valve will be of such design that the float cannot blow shut at any air velocity including sonic velocity. A surge check shall be installed on the inlet to reduce the flow of extremely high velocity water during closing to minimize slam and shock for valves 3 inches and larger. For valves smaller than 3 inches, a deep well throttling device shall be incorporated.

4. All air valves and accessories shall be supplied by a single manufacturer and shall be GA Industries, APCO Valve Corporation, Crispin, Val-Matic, or approved equal.

2.05 PRESSURE REDUCING VALVES

A. High Capacity Pressure Reducing Valve

1. The reducing valve shall maintain a uniform downstream pressure as pre-adjusted on the control pilot handwheel or adjusting screw. The control pilot shall be capable of field adjustments from near zero psi to 10 percent above the factory preset pressure. The valve shall be completely piped and ready for installation.

2. The main valve shall operate on the differential piston principle, such that the area on the underside of the piston is no less than the pipe area, and the area on the upper surface of the piston is of a greater area than the underside of the piston. The valve piston shall be guided on its outside diameter by ports that minimize the effects of throttling. Throttling shall be done by the ports and not by the valve

seating surfaces.

3. Valves shall be of a cast iron body per the requirements of ATSM A126 with ANSI flanges. The valve interior shall be bronze.

4. The valve shall be capable of operating in any position and shall incorporate only one flanged cover at the valve top from which all internal valve parts shall be accessible. There shall be no stems, stem guides or spokes within the waterway, or springs to assist in valve operation.

5. Valve seals shall be easily renewable. All controls and piping shall be of non-corrosive construction.

6. Valves shall be manufactured by Golden Anderson, or approved equal.

B. Standard Capacity Pressure Reducing Valve

1. Regulators shall be cast bronze body, stainless steel seat ring with ½ to 2-inch NPT threaded connections.

2. Provide regulator with separate “Y” type strainer with 20 mesh stainless steel screen and removable plug. Attach strainer at the inlet end of regulator with bronze nipple.

3. Unless otherwise noted, pressure regulator shall be factory set at 45 psi and have an adjustable range of 25 to 84 psi using external adjusting screw. Valve shall be rated for 150 psig minimum inlet water pressure.

4. Valves shall be manufactured by Watts No. 25AUB, Mueller H-9300 Series or approved equal.

2.06 VALVE OPERATOR ACCESSORIES

A. Pedestal Operators for Valves

1. Non-geared pedestal type operators shall be provided and installed as shown on the Drawings. Operators shall be high strength cast iron. Non-geared operators shall be equipped with indicators to show valve position and shall have handwheel operator. Operators shall be non-rising stem or rising stem valves. Operators shall be manufactured by Clow, Troy, an approved equal or shall be an accessory product of the valve manufacturer.

2. Geared pedestal operators shall be provided and installed as shown on the Drawings. Geared operators shall be equipped with valve position indicators and crank type handle. The operators shall be manufactured by Clow, an approved equal or shall be a product of the valve manufacturer.

B. Chain Wheels: Chain wheels shall be ductile iron. Operating chains shall be galvanized. Unless otherwise specified, valves with centerlines more than 7 feet, 6 inches above the specified operating level shall be provided with chain wheels and operating chains. Chain wheel operated valves shall be provided with a chain guide. Operating chains shall be looped to extend within 4 feet of the specified operating level below the valve. For plug-type valves 8 inches and larger, the operator shall be provided with a hammer blow wheel. Hooks shall be provided for chain storage where the chain may hang in a walkway.

C. Stem Guides: Fully adjustable stem guides with bronze bushings, shall be furnished by the manufacturer of the associated valve and shall be installed as shown on the Drawings and wherever necessary to prevent unsupported stem lengths of 10 feet or more.

D. Extension Stems: Extension stem shall be stainless steel and shall be furnished by the manufacturer of the associated valve to bring the operating nut to within 6-inches of finished grade. Extension stems shall be sized by the valve manufacturer to withstand the maximum valve operator output.

E. Valve Boxes: All valves below ground level shall be furnished with a valve box and cover. Each shall be of the roadway extension type, or proper length and base size with suitable detachable cover, bituminous coated inside and out. Boxes shall be 5 1/4 inch inside diameter, "Standard Telescopic Valve Box" as manufactured by American Cast Iron Pipe Co. or approved equal.

F. Floor Boxes: Valve floor boxes shall be provided where shown on the Drawings. Floor boxes shall be manufactured by Vulcan Industries, Troy, Clow F-5695, U.S. Foundry, American-Darling, Neenah, M & H Valve or an approved equal.

G. Wrench Nuts: Wrench nuts shall comply with Section 3.16 of AWWA C500. A minimum of two operating keys, but no less than one key per every ten valves, shall be provided for operation of the wrench nut operated valves.

2.07 STAINLESS STEEL BALL VALVES (3-INCHES AND SMALLER)

A. Ball valves 2-inches in diameter and smaller shall be 3-piece, full port and stainless steel body construction. Ball valves 2-1/2-inches in diameter shall have reduced port with 3-piece stainless steel body construction. Valve shall have threaded ends and a lever operator. Ball shall be 316 stainless steel with TFE seats and packing.

B. Unless otherwise shown on the Drawings, stainless steel ball valves shall be used where the piping material is stainless steel.

C. Motorized actuators shall be provided where shown on the Drawings.

D. Ball valves shall be manufactured by Watts, Apollo Neles-Jamesbury Series or approved equal.

2.08 NEEDLE VALVES

A. PVC Needle Valves

1. Chemical feed needle valves shall be non-shock, thermoplastic type of Type 1, Grade 1 PVC with O-ring stem seal and Teflon stem seat. Valve shall withstand 150 psi pressure and shall incorporate a positive stop for safe operation. All parts shall be corrosion resistant materials, specifically suited for process chemical.

2. Unless otherwise shown on the Drawings, PVC needle valves shall be used where the piping material is PVC.

3. PVC needle valves shall be manufactured by Hayward, Chemtrol or approved equal.

B. Stainless Steel Needle Valves

1. Needle valves shall be integral bonnet design with forged stainless steel body and stem and adjustable TFE packing. Valves shall have a minimum 0.375 orifice and regulating type stem. End connections shall be 1/2-inch NPT.

2. Unless otherwise shown on the Drawings, stainless steel needle valves shall be

used where the piping material is stainless steel.

3. Valves shall be manufactured by Whitey, No. SS-18VF8 or approved equal.

2.09 PVC DIAPHRAGM VALVES

A. Diaphragm valves shall be non-shock thermoplastic of Type 1, Grade 1 PVC. Diaphragm shall be EPDM. Bonnet shall be provided with titanium bolt kit, handwheel and valve position indicator. Valves shall be manufactured by Hayward, Saunders, George Fischer or approved equal.

2.10 PVC BALL VALVES

A. Ball valves shall be non-shock thermoplastic of Type 1, Grade 1 PVC with O-ring stem seal and Teflon ball seat. Valves shall withstand 150 psi pressure. Valves shall have union connections at each end. Valves shall be Hayward "Safe Block", Chemtrol TU Series, Spears (Ture Union) or approved equal.

2.11 PVC BALL CHECK VALVES

A. Ball check valves shall be non-shock thermoplastic type of Type 1, Grade 1 PVC with O-ring ball seal. The valve shall have a true union connection for easy removal. The valve shall operate in the vertical or horizontal position. Valve shall be Hayward "True Check", Chemtrol BC Series, Spears (Ballcheck) or approved equal.

2.12 PVC BUTTERFLY VALVES

A. Butterfly valves shall be non-shock thermoplastic of Type 1, Grade 1 PVC with O-ring stem seal and valve liner constructed of EPDM. Valves shall be lever operated. Valve disc shall be polypropylene with 316 stainless steel shaft. Valve shall be Hayward, Chemtrol, Spears or approved equal.

2.13 PVC SWING CHECK VALVES

A. Swing check valves shall be non-shock thermoplastic of Type 1, Grade 1 PVC with EPDM seals. Disc and hinge pin shall be fabricated from PVC. Valve hardware shall be 316 stainless steel. Valve shall be Hayward, Chemtrol, Spears or approved equal.

2.14 SOLENOID VALVES

A. Solenoid valves shall be 2-way, pilot operated, brass body with Buna-N seal. The solenoid valves shall be for air and water service, and withstand pressures to 150 psi. The valve shall be normally closed and require a 120 volt power supply. Solenoid valves shall be Asco Red Hat Model 8210 or approved equal.

2.15 PRESSURE GAUGES

A. For installation on pump discharge as shown on the plans shall be of Bourdon tube design with brass tube and polished steel case, equal to Ashcroft general service gauge, Type 1009. The size shall be 3-1/2 inches. The range shall be selected during shop drawing review, but the gauge will be sized to operate at its midpoint.

B. For installation on process equipment, use Ashcroft: Model No. 35-1032S-20L or approved equal. The size shall be 3-1/2 inches. The range shall be selected during shop drawing review, but the gauge will be sized to operate at its midpoint.

2.16 STRAINERS

A. Strainers shall be “Y” strainers to protect piping system components from damage caused by dirt or debris in the process media.

B. Schedule 80 PVC “Y” strainers shall be supplied with a 1/32-inch perforated, ultrasonically welded, plastic screen. The screen shall have an open area at least twice that of the equivalent pipe size cross sectional area to minimize pressure drop. Strainers should be operational in vertical or horizontal applications. Strainers shall have a heavy-duty cap that permits quick and easy removal of the strainer screen when cleanout becomes necessary without removing the device from the line. O-rings shall be provided to prevent leakage at the removable cap. Schedule 80 PVC “Y” strainers shall be manufactured by Hayward or approved equal.

C. “Y” strainers for potable water shall have a cast bronze main body and cover per ASTM B584. The strainer screen shall be 30 mesh, 300 series stainless steel and accessible without removing the device from the line. The “Y” type strainer shall be a Wilkins Model S or approved equal.

2.17 BACKPRESSURE VALVE

A. When not specified to be provided under appropriate chemical feed specification, this specification shall apply.

B. Backpressure Valve shall be an in-line diaphragm style back pressure/anti-siphon control valve, with built-in air release. Complete with 1/4” gauge port, located on side of valve for pressure reading, long life TFE laminated diaphragm, and adjustable pressure range of 0-150 PSIG. Color-coded handle, with turn down limits maximum pressure setting to 150 PSIG. Valve is factory set for 50 PSIG, complete with lockable nut on handle to prevent setting changes. Standard maximum temperature of 140 Degree F (60C). As manufactured by Primary Fluid Systems Inc., or approved equal.

2.18 PRESSURE RELIEF VALVE

A. When not specified to be provided under appropriate chemical feed specification, this specification shall apply.

B. Pressure Relief Valve shall be an in-line diaphragm style pressure relief control valve, with built-in air release. Complete with ¼” gauge port, located on side of valve for pressure reading, long life TFE laminated diaphragm, and adjustable pressure range of 0-150 PSIG. Color-coded handle, with turn down limits maximum pressure setting to 150 PSIG. Valve is factory set for 50 PSIG, complete with lockable nut on handle to prevent setting changes. Standard maximum temperature of 140 Degree F (60C). As manufactured by Primary Fluid Systems Inc., or approved equal.

2.19 CALIBRATION CYLINDERS

A. When not specified to be provided under appropriate chemical feed specification, this specification shall apply.

B. Calibration cylinder shall be made of a highly translucent PVC material. Graduation to be easy to read imprinted blue lettering with polypropylene coating to ensure chemical resistant. Shall have dual scale USGPH & ml, with ascending and descending increments. Bottom connection to be a high quality machined FNPT of PVC material. Top connection to be either open top or threaded FNPT or removable dust cap and of PVC material. As manufactured by Primary Fluid Systems Inc., or approved equal.

2.20 PULSATION DAMPENER

A. When not specified to be provided under appropriate chemical feed specification, this specification shall apply.

B. Pulsation Dampener shall be hydropneumatic, bladder type and of appendage (vertical type) design. The construction shall be of two chambers, a fluid chamber and a pressure chamber, separated by an elastomeric bladder. The two chambers shall be secured with bolts, directly on all metal and API plastic units or with the use of a ring flange arrangement on other plastic units. Pulsation dampener shall be designed at a minimum safety margin of 4:1 burst pressure to maximum working pressure. Pulsation dampener shall be fitted with automotive type gas fill valve with high-pressure core and cap. Pulsation dampener shall be fitted with a pressure gauge. Pulsation dampener shall be capable of handling pump's maximum stroke volume. As supplied by Primary Fluid Systems Inc., or approved equal.

2.21 DIAPHRAGM ISOLATORS

A. When not specified to be provided under appropriate chemical feed specification, this specification shall apply.

B. Diaphragm Isolator shall be designed to mount in system to accurately set and monitor system pressures. Diaphragm isolator is to protect mounted pressure gauge from corrosive or slurry laden process fluids. Wetted body shall be made of either PVC, polypropylene, PVDF, 316/s, Alloy20 or Hastelloy C, and isolation diaphragm shall be Viton, Teflon, or 316/s, for optimized chemical resistance to the process fluid. Isolators shall be filled with temperatures stable glycerin. Gauge isolator shall have 1/4" FNPT connections. Pressure gauge mounted shall be a 2-1/2" and 0-160 PSI. As supplied by Primary Fluid Systems Inc., or approved equal.

2.22 DEGASSING VALVES

A. When not specified to be provided under appropriate chemical feed specification, this specification shall apply.

B. ACCU-VENT is an automatic degassing valve, designed to vent gases that cause vapor lock in metering pumps. Designed for use with sodium hypochlorite, hydrogen peroxide and sulfuric acid applications. Body material shall be made of CPVC Corzan™, for optimized chemical resistance. Top and bottom connections are 1/2" FNPT. All vented gases and residual liquid are returned to tank via tubing or piping assembly, as supplied by others. As manufactured by Primary Fluid Systems Inc., or approved equal.

PART 3 EXECUTION

3.01 INSTALLATION

A. All valves and appurtenances shall be installed in the locations shown on the Drawings, true to alignment and properly supported. Any damage to the above items shall be repaired to the satisfaction of the Engineer before they are installed.

B. Install all floor boxes, brackets, extension rods, guides, the various types of operators and appurtenances as shown on the Drawings that are in masonry floors or walls, and install concrete inserts for hangers and supports as soon as forms are erected and before concrete is poured. Before setting these items, the Contractor shall check all plans and figures which have a direct bearing on their location and he shall be responsible for the proper location of these valves and appurtenances during the construction of the structure.

3.02 FIELD PAINTING

A. All exposed, non-buried or submerged valves and appurtenances specified herein shall be painted as part of the work in Section 09 90 00 of these Specifications.

3.03 INSPECTION AND TESTING

A. Following installation, operating tests will be performed to demonstrate to the Engineer that all equipment and accessories will function in a satisfactory manner. The Contractor shall make, at Contractor's own expense, all necessary changes, modifications and/or adjustments required to ensure satisfactory operation.

END OF SECTION

SECTION 26 05 00

ELECTRICAL, GENERAL PROVISIONS

PART 1 GENERAL

1.01 FEES Unless specifically stated otherwise the Electrical Contractor (herein Contractor) is responsible for paying all fees and obtaining all permits and licenses, arranging for and coordinating all inspections as they relate to the performance of this work. The Electrical Contractor shall deliver permits and certificates as set forth in the contract documents.

1.02 SITE VISIT Before submitting a bid, the Electrical Contractor is responsible for visiting the site to become familiar with conditions which may affect the scope and the cost of the electrical work. The Electrical Contractor is responsible for including in the bid all work required for the installation of a complete and fully functional electrical system.

1.03 DRAWINGS AND SPECIFICATIONS

A. Any references to Division 16 on the plans or in the specifications refer to electrical work and the Electrical Contractor. Likewise references to Division 1 refers to General Requirements.

B. All drawings and specifications to include but not limited to the General Conditions, Supplementary Conditions, Special Conditions and General Requirements Specification Sections and Instructions to Bidders are a part of this contract, are binding on this section of the work and apply to the work of this and all sections for electrical work. Any work called for in the specifications or drawings is to be provided as if it called for by both.

C. It is the responsibility of the Electrical Contractor to review all related drawings and documents, to perform the electrical work contained therein and to inform, coordinate and advise other trades, contractors and subcontractors as to all of the other requirements, conditions and information associated with providing and installing the total job.

D. The electrical drawings are diagrammatic in nature except where specific dimensions, or specific details are shown. The symbols and schematic diagrams and details used in the drawings have no dimensional significance nor do they indicate every item required for the intended installation. The work shall be installed in accordance with the intent diagrammatically expressed on the drawings, and in conformity with the dimensions indicated on the final Civil working drawings and / or on equipment shop drawings. No interpretation shall be made from the limitations of symbols and diagrams that any elements necessary for complete work are excluded. The locations of equipment, area dimensions, site details and conditions affecting the electrical work shall be field verified prior to installation and any discrepancies between the actual field measurements and the drawings shall be brought to the attention of the Engineer. Field measurements take precedence over dimensioned drawings.

E. The electrical drawings and specifications do not include the miscellaneous hardware, fittings, devices, supports, restraints, hangers, braces or materials required for the proper installation of the work and completion of the project. It is the responsibility of the electrical contractor to examine all specifications, drawings and site conditions and to schedule, coordinate, furnish and install the work in a neat and workmanlike manner with the proper materials and equipment required for a complete and working electrical installation. In the event a conflict exists the better quality or higher quantity shall be provided.

F. Catalog numbers and names that appear in the specifications or on the plans may be incomplete or obsolete and are for descriptive purposes only. As such they may not indicate all of the parts, pieces and systems required for a complete and operating installation. It is the responsibility of the Electrical Contractor, the Vendor and the Supplier

to review the plans, specifications and applications to determine the correct item(s) required to include all installation and support materials and systems for a complete and working installation.

G. The contractor shall comply with details applicable to this project.

1.04 DEFINITIONS

A. Furnish – When used in the electrical plans and/or specifications the word “furnish” is defined as to purchase a piece of equipment or material and to have that equipment/material transported to the project site (or other location as directed) to store and protect the equipment and material from damage and theft until put into service. All items to be furnished by the Electrical Contractor shall include any and all mounting hardware, supports, and accessories required for a complete installation and proper operation. Unless noted otherwise, when a piece of equipment or material is to be furnished by the Electrical Contractor it shall also be installed.

B. Install – When used in the electrical plans and/or specifications the word “install” is defined as to unload and transport to the installation point the equipment and/or material. Any and all mounting hardware required for a complete installation shall be included. Perform all operations required for proper installation, to include but in no way be limited to final adjustments, etc.

C. Provide – When used in the electrical plans and/or specifications the word “provide” is defined as to furnish and install complete and ready for use. This is to include any and all options, accessories, and mounting and installation hardware required for a complete and operating system element of the electrical system.

D. The terms “furnish” and “install” require coordination with other trades. This coordination shall be performed prior to bidding and include all work associated with the complete installation of a working system.

1.05 SCOPE

A. Submission of a proposal and acceptance of the agreement or contract for executing the work of this section will be construed as evidence that the Electrical Contractor, Subcontractor, Vendor and Supplier have carefully reviewed and read the plans, specifications, Instructions to Bidders, General Conditions and Special Conditions and understand and accept all conditions implied or stated therein.

B. Work described in these specifications and indicated on the drawings includes but is not limited to furnishing all labor, materials, supplies, equipment, junction boxes, pull boxes, pull wires, support materials, fuses, labels and incidental elements to perform all work required to include cutting, channeling, chasing, excavating, backfilling and tamping to install a complete and working electrical system(s) in accordance with the Specifications and the accompanying drawings. This shall include but is not limited to all required preparation work, the purchasing and storage of materials and equipment, and the coordination and planning required to furnish and install the electrical system in a complete and workmanlike manner in accordance with specifications and drawings and subject to terms and conditions of the contract. Unless noted otherwise on the plans or in these specifications, all final connections are the responsibility of the Electrical Contractor.

C. The work shall include but is not limited to furnishing the supervision, labor, materials, supplies and equipment for the complete and proper installation of:
   1. A complete power distribution system to include but not limited to panelboards, disconnects, circuit breakers, transformers, raceway, conductors, boxes, connections and devices.
   2. Equipment mounting racks to install electrical equipment and equipment furnished

by Others at the approximate location indicated on drawings.

3. A complete grounding system(s) in accordance with specifications, drawings and all federal, state and local codes and requirements.
4. Power supply connections to pumps and pump control equipment furnished by Others..
5. Cutting, patching, trenching, backfilling and tamping as required by the Work;
6. Provision of new duct bank(s), manhole(s), handhole(s), pull boxe(s) and related underground electrical work as required;
8. Coordination with servicing Electrical Utility for new 3-phase electrical services;
9. Connection and Installation of Equipment Furnished Under Other Divisions of the Specification and Drawings.
10. Utility Service Entrances – Electrical;
11. Underground raceways as required for electrical service and connection to pump station equipment.

D. The Electrical Contractor shall obtain all permits, licenses and approvals to perform the work as set forth in the Drawings and Specifications and the General and Special conditions.

1.06 CODES AND STANDARDS

A. Documents referenced in this section are the latest revision or edition, unless otherwise specified. Applicable parts of the referenced documents are a part of this section as if fully included in this section.

B. All work including methods, equipment, materials and installation shall meet or exceed the requirements of the codes and standards listed below.

C. All materials, equipment, devices and fixtures shall be labeled by Underwriter's Laboratories, Inc. (U.L.). If a piece of equipment, device, etc. is not available with a U.L. label the Electrical Contractor may submit proof of conformance to the National Electrical Code (NEC), the National Electrical Safety Code, the American National Standards Institute (ANSI), the American Society for Testing and Materials (ASTM), the institute of Electrical and Electronics Engineers (IEEE) and applicable Standards and Codes as listed below. Any material, equipment or device not labeled by U.L. will not be considered acceptable without written permission by the Engineer.

D. Applicable Standards and Codes.

1. Codes: Conform with the requirements and the recommendations of the latest edition of the National Electrical Code, and all federal, state and local codes and ordinances. In conflicts between codes, the more stringent requirements shall govern.
2. Standards: The Specifications and Standards of the following organizations are by reference made a part of these specifications, unless otherwise indicated in writing, comply with their requirements and recommendations wherever applicable. Materials, equipment and the installation shall meet or exceed the requirements of all local codes and requirements and the most current codes and standards listed below.

-Underwriters' Laboratories, Inc. (U.L.)
-Institute of Electrical and Electronic Engineers (IEEE)
-National Electrical Code (NEC) 2011
-American National Standards Institute (A.N.S.I.)
-American Society of Testing Materials (A.S.T.M.)
-Electrical Testing Laboratories (E.T.L.)
-Insulated Cable Engineers Association (I.C.E.A.)
-National Bureau of Standard (N.B.S.)
-International Building Code (IBC) 2015
-National Electrical Manufacturer's Association (N.E.M.A.)

-National Electrical Contractors Association (NECA)
-All Federal, Local and State Codes and Ordinances
-NFPA Codes

3. Requirements of Regulatory Agencies: The requirements and recommendations of the Occupational Safety and Health Act as well as all requirements for the specific type of installation as required by S.C. DHEC are by reference made a part of these Specifications and all electrical Work shall comply with their requirements and recommendations wherever applicable.

1.07 RECORD DRAWINGS

A. Contractor shall maintain on the job site one complete set of drawings for this project. All changes authorized by the Engineers and/or the Owner as to the locations, sizes, etc. of equipment, conduit, fixtures, and/or other material and equipment shall be indicated in red pencil on the drawings as the work progresses.

B. At the completion of the project, the Electrical Contractor shall transfer any changes to the project to a new set of complete electrical drawings. This set of drawings shall be provided to the Civil Engineer along with any other copies of drawing, specifications, etc. required by the Civil Engineer.

PART 2 PRODUCTS

2.01 BASIC MATERIALS

A. All materials, equipment and devices are to be new, clean and in good condition.

B. All materials shall meet the applicable provisions of Codes and Standards listed above.

C. All similar devices shall be of the same manufacturer. This shall include but in no way be limited to electrical gear, receptacles, switches, etc.

D. Substitution of any materials, equipment and devices shall not result in any increase in the cost of work. Substitution is only permitted with written approval by the Engineer.

E. Workmanship shall be in accordance with best practice and standards of the day.

2.02 REQUESTS FOR SUBSTITUTION

A. Requests for Substitution shall comply with the General Requirements included in other Sections of these Specifications.

B. Submit requests for substitution to Engineer no fewer than ten (10) working days prior to bid time. Any approval will be in writing by the Engineer.

C. Requests for substitution shall provide the following information:
1. A complete list of items for which approval is requested.
2. Date, project name, company name on the list of items.
3. Specification sheets with catalog number for equipment. Photocopies of catalog pages will not be accepted
4. Approval of a substitution shall not increase the cost of the work or provide any extension in contract time.
5. Approval of the Engineer to use materials and/or equipment will be in the form of a written addendum. No substitutions will be allowed if substitutions are not submitted to the Engineer a minimum of ten (10) working days prior to the bid opening date.

2.03 SHOP DRAWINGS

A. Electrical Subcontractor shall submit for review by the Engineer detailed shop drawings of all equipment and all material listed below. All submittal data under each specification section shall be submitted at one time. Partial submittals will not be reviewed by the Engineer. No material or equipment for which Engineer's review is required shall be delivered to the job site or installed until the Electrical Contractor has in his possession the reviewed and approved shop drawings for the particular material or equipment. The Electrical Contractor shall assemble, organize, prepare and review for correctness shop drawings on all materials, equipment and fixtures and devices to be used. The Electrical Contractor shall furnish the number of copies specified by the Civil Engineer or six (6) copies of shop drawings if no number is specified by the Civil Engineer. Shop drawings that are incorrectly submitted, contain errors or omissions, or not in the form and sequence specified shall be rejected as unapproved. Additional reviews of the shop drawings by the engineer caused by errors or omissions or mistakes by the Contractor or his suppliers may result in additional charges for engineering services to the Contractor. The shop drawings shall be complete as described herein.

B. Review of shop drawings in no way relieves the contractor of his responsibility of quantity, dimensions, weights, means and methods, safety, or coordination with others.

C. The General Contractor and Electrical Contractor shall review shop drawings prior to submittal to the Engineer. The General Contractor and Electrical Contractor shall note on the first page of each section of shop drawings that said drawings are approved. If there are deviations from items as specified, deviations shall be tabbed and marked in the shop drawings by the Electrical Contractor.

D. Shop drawings shall be detailed drawings or specification sheets with dimensions showing construction, physical size, arrangement/layout, required clearances, any applicable performance characteristics and capacity.

E. Samples, drawings, specifications, catalogs, submitted for review shall be properly labeled indicating specific service for which material or equipment is to be used, section and article number of specifications governing, contractor's name, and project name.

F. General catalog pages of photocopies of will not be accepted.

G. Failure of the Contractor to submit shop drawings to the Engineer with reasonable time for review shall not entitle the Contractor to an extension of contract time. Reasonable review time is fifteen (15) working days unless otherwise specified.

H. At minimum shop drawings shall be submitted for:
   1. Electrical gear
   2. Basic materials: wire, boxes, conduit, fittings, wiring devices
   3. Other material and equipment as required per plans and other specification sections.
   4. Restraint and anchoring methods and hardware for electrical systems.

2.04 OPERATING AND MAINTENANCE MANUALS

A. Provide owner with operation and maintenance manuals. Use multiple binders if a single binder would exceed 2.5" in thickness; arrange the data in the same sequence as the specification section; delete or mark through inapplicable data.

B. Provide tab pages to separate each major item or closely related group of items with typed item names on the tabs. Supply a table of contents at the beginning of each volume listing all items, the manufacturers and the name, address and phone number of the nearest authorized service representative.

C. Manuals shall include the following, in addition to operation, maintenance and lubrication instructions and parts lists:
   1. Power and Control Wiring Diagrams
   2. Schematic Diagrams
   3. Power Equipment Submittals
   4. All other systems which required submittal of shop drawings.

2.05 OPERATING INSTRUCTIONS, PANELBOARD DIRECTORIES AND NAMEPLATES

A. Install in each panelboard or pump control panel with circuit breakers a single-sided plastic-covered, typewritten circuit directory in metal frame. Indicate name, address and service telephone number of installer. Directory shall list the load(s) served and the location of the load(s) for each breaker.

B. Nameplates Provided by Contractor: Provide engraved plastic laminate nameplates on all panelboards, disconnect switches, and enclosures. For power systems, nameplates are to be 1/16" thick plastic with 1/4" high white letters on black background made from UV and weather resistant material. Attach nameplates with epoxy cement, do not drill or screw into weatherproof enclosures. Panel nameplates shall indicate system voltage, phases, panel name and where fed from.

C. Nameplates Provided by Equipment Manufacturers: All switchboards, panelboards, transformers, safety switches and the like shall be provided with engraved metal nameplates which state all industry-standard required data about the labeled equipment. Nameplates shall be affixed with screws or rivets. The use of paper nameplates only will not be accepted.

PART 3 EXECUTION

3.01 BASIC METHODS

A. Coordinate with other trades to provide electrical work in correct locations for each piece of electrical equipment connected.

B. For all rack mounted and exterior equipment, use galvanized hardware and appropriate fastener types for mounting type.

C. Locate all equipment at heights to avoid splash up from the ground below. Heights shown in drawings may be varied to suit equipment and rack, but shall in all cases comply with codes.

D. Welding: All welds shall be de-slagged, wire brushed, primed and painted within 24 hours. All welds shall be coated with cold galvanizing compound after being prepared as described.

E. For all underground power and signal circuits installed in raceway or direct buried, furnish and install a warning tape to mark the location of below grade installations to anyone digging in the area. The warning tape shall be six (6) inches wide, yellow in color, with the words "CAUTION - UNDERGROUND ELECTRICAL CIRCUITS" printed on the tape. Install this tape twelve (12) inches below grade, directly over the underground circuits.

F. Perform all work in a neat and workmanlike fashion in keeping with the best practices of the day and in compliance with all Federal, State and Local laws, ordinances and codes and the Specifications, Plans and Contract documents.

3.02 EQUIPMENT DELIVERY, STORAGE, INSTALLATION

A. Where equipment is purchased by the electrical contractor to be installed in conformance with the contract documents, the contractor shall follow the following procedure as it relates to delivery, storage, and installation:
   1. Coordinate any and all information with any and all contractors who are to do work to accommodate the electrical equipment/work.
   2. Coordinate delivery of equipment.
   3. Unload the equipment from delivery trucks.
   4. Inspect the equipment to assure correct make, model number, voltage, etc.
   5. Provide for safe handling and field storage up to the time of permanent placement in the project.
   6. Provide for any and all field assembly and internal connection as may be necessary for proper operation.
   7. Install in place including any and all required mounting supports, connectors, fittings, connections, and accessories required for complete system operation.

B. Where equipment is purchased by the Owner and is to be installed by the Electrical Contractor, the Electrical Contractor shall follow the following procedure as it relates to delivery, storage, and installation:
   1. Coordinate equipment shop drawings with any and all contractors who are to do work to accommodate the electrical equipment /work.
   2. Coordinate delivery of equipment.
   3. Unload the equipment from delivery trucks.
   4. Inspect the equipment to assure correct make, model number, voltage, etc.
   5. Inspect the equipment for any damage or corrosion. Claims that any of these items have been received in such condition that their installation will require work beyond the reasonable scope of the work will be considered only if presented in writing to the Architect/Engineer within 10 days of delivery.
   6. Provide for safe handling and field storage up to the time of permanent placement in the project.
   7. Provide for any and all field assembly and internal connection as may be necessary for proper operation.
   8. Install in place including any and all required mounting supports, connectors, fittings, connections, controls, and accessories required for complete system operation.

3.03 COORDINATION WITH OTHERS

A. The Electrical Contractor is responsible for coordinating the installation of all electrical work with the work of other contractors, subcontractors and/or trades. The Electrical Contractor shall refer to the other drawings to include but not limited to site, civil, and Utility to assure that the electrical work is installed in a coordinated fashion. Conflicts on installation work due to the lack of proper coordination of the Electrical Contractor shall result in the work being removed and coordinated and properly reinstalled at no increase in cost to the Owner.

B. Separate sub-contracts and sub-sub-contracts for electrical work may be issued by the General Contractor or Sub-Contractor to other Sub-Contractors or Sub-Sub-Contractors and/or suppliers. It is the responsibility of the Electrical Contractor to inform and advise those other contractors, subcontractors and/or suppliers of the requirements and conditions of the Work and to coordinate the Work so as to fulfill the requirements of the project according to the construction documents.

C. The electrical drawings and specifications that relate to the electrical service(s) and connection(s) for and to equipment furnished and installed under other sections of the contract documents to include process control equipment are based on the specified equipment only. If the equipment installed under other divisions of the contract documents

is not the specified equipment but is an approved equal to the specified equipment the electrical requirements may differ from the specified equipment. It is the responsibility of the installing contractor or subcontractor of the “approved equal equipment” to coordinate the electrical requirements with the Electrical Contractor. If the electrical requirements of the “approved equal equipment” are greater than the specified equipment and result in an increase in the electrical cost, the additional costs are the responsibility of the furnishing/installing contractor or subcontractor.

D. Prior to offering a price proposal and during the execution of this Contract it is the responsibility of the Electrical Contractor to coordinate with other contractors and subcontractors the installation and electrical service requirements and electrical connection of all equipment being installed under other divisions of the Contract documents. Any cost associated with the electrical service and connection of the specified equipment of other divisions shall be borne by the Electrical Contractor at no additional cost to the Owner.

E. The Electrical Contractor will supply power to equipment at the voltage indicated on the Electrical drawings. The Electrical Contractor and all other contractors will be held responsible for coordinating the equipment voltages, control equipment, wiring, and locations and type of terminations/connections and/or disconnects required to comply with the National Electrical Code, International Building Code, all other applicable national, international and local codes, and the equipment manufacturer's requirements. If equipment is furnished to the project at a voltage other than that shown on the Electrical drawings, the contractor supplying the equipment and all other subcontractors will be held responsible for making any necessary adjustments to correct the conflict, to the satisfaction of the Electrical Engineer.

F. Coordinate with other trades, this is to include the installation of electrical equipment, devices, etc. in correct locations for each piece of equipment electrical or otherwise.

G. Obtain manufacturers equipment drawing(s) with rough-in diagrams equipment and install electrical work accordingly.

H. Report to the Engineer any and all discrepancies that the contractor(s) finds in the field between the electrical drawings and the other drawings.

3.04 EXCAVATION AND BACKFILLING

A. Provide under this contract all necessary excavation and backfilling for the installation of electrical work.

B. Prior to any backfilling the Engineer shall be notified and the Owner’s representative shall observe and approve the work.

C. Provide safety (warning) barricades around all open trenches and holes before leaving unattended. Cover all open trenches and holes where possible. Do not leave exposed wiring in a trench unattended.

D. Backfilling and tamping shall be done according to best practices and standards of the day.

E. Trenches, holes and the like shall be filled so that they match finished grade after any settlement has been given adequate time to occur. Any vegetation shall be replaced to match existing conditions surrounding the work.

3.05 ELECTRICAL WORK FOR MECHANICAL SYSTEMS

A. The Electrical Contractor is to provide complete wiring for power to pump control equipment. This includes but is in no way limited to conduit, conductors, switches,

disconnects, etc. Coordinate with Civil drawings and equipment being furnished under other divisions of the Specifications and provide all labor and materials as required for a complete electrical system.

B. Control wiring to pump equipment from pump control panel is furnished by Others unless noted otherwise in plans or specifications. Conduit and raceway for control wiring is to be provided by the Electrical Contractor and the Electrical Contractor is required to coordinate any raceway or conductor requirements with the pump and control panel vendor prior to submitting bid.

3.06 EQUIPMENT FOUNDATIONS, SUPPORTS AND MOUNTING

A. All mountings are to be secured to structure and seismically braced to comply with Codes. Where additional structural members such as columns, beams, and the like are required to mount equipment, they shall be provided at no additional cost to the Owner.

B. Painting: Paint all supports used in electrical construction with a primer and then paint machine gray if using painted or bare steel. Paint all cuts and bare metal on galvanized steel supports used in electrical construction with a cold galvanizing paint. Limit painting of factory furnished equipment to touching up surfaces marred during shipment or installation, unless specified otherwise in Contract.

3.07 GUARANTEE OF WORK, EQUIPMENT AND MATERIALS

A. The complete system shall be free of faults, short circuits, grounds and open circuits. Balance loads across phases to obtain minimum neutral current in feeders and branch circuits.

B. The Electrical Contractor shall engage the services of a recognized corporately independent firm for the purpose of performing inspections and test as herein specified. The testing firm shall provide all material, equipment, labor and supervision to perform such tests and inspections. The firm shall be prior approved by the Engineer.

C. It is the intent of these tests to assure that all tested electrical equipment and systems are operational and within industry and the manufacturer's tolerances and are installed in accordance with the design Specifications. The test and inspections shall determine suitability for energization.

D. Written documentation of the tests and inspections shall be provided and shall include the following information:

1. Project name and location.
2. The date the test are performed and the inspections are made.
3. The corporate name, address and telephone number(s) of the organization performing the tests and inspections.
4. The name of the person(s) supervising or performing the test.
5. The weather conditions to include humidity and temperature at the time of testing and inspection.
6. Identification, location and description of the systems, equipment, conductors, feeders and devices tested.
7. The type of testing equipment used for testing.
8. The results of the tests and inspections.

E. Provide one qualified electrician to accompany and assist in locating, preparing and verifying the equipment, conductors, systems and devices to be tested. Test systems as required in the presence of the Electrical Contractor or his assigned representative or the Engineer or his representative. Systems and equipment are to be tested and operated to verify compliance with the requirements of the contract documents and applicable codes.

F. Equipment, systems, conductors and devices to be tested are as follows:
    1. Power Distribution Equipment shown on the one-line (Power Riser) diagram.
        a. Proper torque values on lugs and connectors.
        b. Proper operation of equipment ground fault protective devices.
    2. Conductors – Conductors rated 100 amperes and above.
        a. Proper conductor and insulation type
        b. Insulation resistance test (Megger) at 1000 volts DC for 1 Minute or per cable manufacturer specifications.
        c. Minimum insulation resistance values shall not be less than fifty (50) megohms.

G. Grounding
    1. Test ground resistance using the attached rod technique (ART) or the fall of potential method according to IEEE 81 at the service entrance.
    2. Verify proper type and size of grounding conductors and proper ground connections.
    3. If ground resistance exceeds 10 ohms or values otherwise specified in the Specifications, equipment requirements or General or Special Conditions notify the Engineer immediately.

H. Grounding and Ground Fault Personnel Protection
    1. Test ground fault receptacles and ground fault branch circuit breakers.

I. All devices which must be adjusted or set to operate on a schedule (time clocks, program mechanisms, etc.) shall be set prior to substantial completion to operate on schedules directed by the Owner. Instruct the owner on the proper operation of these devices.

J. The Electrical Contractor is responsible for the following:
    1. The Electrical Contractor shall provide a suitable and stable source of electrical power to each test site.
    2. The Electrical Contractor shall notify the testing firm when equipment and systems become available for testing. The Work shall be coordinated to expedite project scheduling. The Electrical Contractor shall correct all defects at no additional cost to the Contractor or Owner.
    3. All tests are to be performed with equipment and/or systems de-energized except where otherwise specifically required.

K. All testing and inspections are to follow any and all safety practices and policies of the Owner, Contractor, Electrical Contractor, OSHA, NETA, NFPA70E and the American National Standards for Personnel Protection.

L. Testing: In addition to testing required under these Specifications, the Owner reserves the right to conduct independent acceptance tests on such portions of the installation as he sees fit. Acceptance tests will be to determine fulfillment of the Contract requirements, and will be conducted in the presence of the Owner and the Contractor. Timely notification of acceptance tests will be given. Correct all deficiencies in materials and workmanship revealed by the acceptance tests.

M. The Electrical Contractor shall provide one qualified electrician to accompany and assist in locating, preparing and verifying the equipment, conductors, systems and devices to be tested.

N. Third Party Inspections

    1. All inspections listed below are to be performed by a person or persons having a Professional Engineering License in Electrical Engineering and five years of experience in the construction industry or by a person who has passed the required examination to be certified by the International Code Counsel as a Commercial

Electrical Inspector, or by a person having a current Master Electrician License and a current Unlimited Mechanical License for Electrical Contracting.

2. Inspections Required:
   All inspections are to be performed by a person or persons having the qualifications stated in #1 above. The inspections are to determine compliance with the Specifications for the project and compliance with the National Electrical Code. The results of all inspections are to be documented in typed report form stating the date of the inspection; the corporate name, address and telephone number of the company performing the inspection; the name of the inspector and the type of problems, noncompliance or violations observed. The inspection is to specifically address the following:
   a. Panelboards and disconnects – Correct grounding and proper termination of conductors. Correct interrupting capacity, over current protection and bus bar material. Proper clearances. Correct labeling. Proper location of disconnecting means.
   b. Grounding Conductors – Proper size, materials and termination.
   c. Conductor Size and Marking – Proper conductor type, size and color coding.
   d. Raceway – Proper use, size and support of raceways.
   e. Ground Fault Protection – Proper use and location of ground fault protective devices and equipment.

O. Corrections in deficiencies shall be the responsibility of the Electrical Contractor. Any equipment which is defected or damaged is to be replaced unless repair is authorized by the Engineer.

3.08 DAMAGES

A. Repair of any damages to site due to acts of the Electrical Contractor during the construction and warranty period. The cost of repairing damage to the site during construction and guarantee period resulting from this work is a part of this contract.

B. Any damages, additional work or cost incurred by other contractors or subcontractors due to re-work required of this Electrical Contractor will be the responsibility of the Electrical Contractor.

3.09 WARRANTIES

A. The warranty is one year from the date of occupancy or as required by the Architect. This warranty includes the correction of any defects to the electrical system(s) related to materials, equipment, workmanship and operation.

B. In addition, the Electrical Contractor is responsible for:
   1. The removal of any items not specified or approved.
   2. The proper and quiet operation of all systems in accordance with the design.

C. This warranty in no way supersedes any manufacturer's warranties.

3.10 CONSTRUCTION SEQUENCE

A. The project may be constructed in phases. The Electrical Contractor shall verify any phasing/scheduling requirements prior to bidding and plan work to minimize disruption to areas outside of the current phase of work. Coordinate with Civil plans and General Contractor.

END OF SECTION

SECTION 26 05 19

WIRE AND CABLE – 600 VOLTS AND LESS

PART 1 GENERAL

1.01 RELATED DOCUMENTS The general provisions of the contract including General and Special Conditions and General Requirements shall apply to all work under this Section.

1.02 SCOPE OF WORK Provide insulated wire and cable for low voltage electrical systems of 600 volts or below.

1.03 RELATED SECTIONS

A. Electrical General Provisions Section 26 05 00.

B. All other electrical specification sections.

1.04 STANDARDS

A. Except as modified by Federal, State and Local Codes and by the Contract Documents, comply with the latest applicable provisions and latest recommendations of the following:
   1. General: Underwriters' Laboratories labeling of all insulation and jackets.
   2. Rubber Insulated Wire and Cables
      a. ICEA pub. No. S-19-81 (NEMA Pub. No. WC 3): Rubber-Insulated Wire and Cable for the Transmission and Distribution of Electrical Energy.
      b. UL 44: Rubber-Insulated Wires and Cables.
   3. Thermoplastic Insulated Wire and Cables
      a. ICEA pub. No. 1 S-61-402 (NEMA Pub. No. WC 3): Thermoplastic-Insulated Wire and Cable for the Transmission and Distribution of Electrical Energy.
      b. UL 83: Wires, Thermoplastic-Insulated.
   4. Cross-Linked Thermosetting-Polyethylene Insulated Wire and Cables
      a. ICEA pub. No. S-66-524: (NEMA Pub. No. WC 7): Cross-Linked Thermosetting-Polyethylene-Insulated Wire and Cable for the Transmission and Distribution of Electrical Energy.
      b. UL 44: Rubber-Insulated Wires and Cables.
      c. UL 854: Service-Entrance Cables.
   5. Annealed Copper Wire for Conductors
      a. ASTM B-3: Soft or Annealed Copper Wire.
   6. Insulation Thickness for Individual conductors
      a. N.E.C. Table 310-13: Conductor Application and Insulation.

1.05 DELIVERY, STORAGE, AND HANDLING Deliver wire and cable to job site on reels or coils marked in accordance with N.E.C. Protect from physical damage. Seal the ends of all conductors exposed to the weather with rubber insulating tape or shrinkable thermoplastic covers

PART 2 PRODUCTS

2.01 WIRE AND CABLE

A. General
   1. Wire is to have a minimum insulating rating of 600 volts, except for wire, used in 50 volts or below applications. Signal systems control wire is to be 300 volt minimum. Where conductors are permitted to be incorporated with other wiring systems the insulation of the wire is to be the same as the highest voltage rating required for any one conductor.

B. Conductor
1. Electrical grade annealed copper. Tinned if rubber insulated, and fabricated in accordance with ASTM standards. Minimum size # 12 for branch circuits and # 14 for control wiring.
2. All conductors depicted on the drawings are copper unless otherwise noted.

C. Stranding
1. Conductors for lighting and receptacle circuits may be solid 12 gauge or 10 gauge as required. Conductors for motor loads, inductive heating loads, controls and resistive heating loads shall be stranded.
2. Cables larger than 10 gauge AWG shall be stranded in accordance with ASTM Class B stranding designations.
3. Control wires shall be stranded in accordance with ASTM Class B stranding designations.

D. Insulated Single Conductors
1. Type THHN/THWN - Frame retardant: Heat-resistant thermoplastic insulation, nylon jacket rated for 90 C dry/75C wet operation shall be used for branch circuit wiring.
2. Use type THHN/THWN or RHW or XHHW, rated for 90 degrees C, for feeder circuits.
3. Use type XHHW or RHW rated for 90 degrees C for all circuits in wet locations, duct banks, underground conduits and service entrance applications.

E. Color Coding
1. Provide consistent color coding of all circuits as follows:
   a. 120/208 volts code
      Phase A - Black.
      Phase B - Red.
      Phase C - Blue.
      Neutral - White.
      Ground - Green.
   b. 277/480 volts code
      Phase A – Brown
      Phase B – Orange
      Phase C – Yellow
      Neutral – Gray
      Ground - Green
2. Color-code wiring for control systems installed in shall be in conjunction with mechanical and/or miscellaneous equipment in accordance with the wiring diagrams furnished with the equipment. Factory color code wire number 6 and smaller. Wire number 4 and larger may be color coded by using tape of the appropriate color on a minimum of two (2) inches of the exposed ends.
3. Multi-Conductor Control, Signal, and Communication (100 conductors or fewer per cable) shall be marked in accordance with Table 5-1, Part 5 of ICEA Pub. S-61-402 (NEMA WC 5).
4. Substitutions for Color-Coded Wire may be made with written approval of the Engineer and Owner's Representative.
5. Where color coding cannot be readily provided because of limited quantities involved, either of the following methods may be used: Plastic tape applied spirally and half-lapped over exposed portions of conductors within manholes, boxes, and similar enclosures. Colored tubing or heat shrink tubing cut and inserted over ends of wire prior to installing terminals.
6. Substitutions may be allowed for color coding for multi-conductor control cable with written permission form the Engineer. Acceptable substitutions that may be approved are printed conductor identification instead of color-coding.

2.02 CONNECTORS Make all connections, splices, and taps and joints with solderless devices, mechanically and electrically secure. Protect exposed wires and connecting devices with electrical tape or insulation to provide insulating properties and protection not less than that of the conductor insulation.

2.03 ELECTRICAL TAPE

A. Shall be specifically designed for use as insulating tape.

B. Super 33+ Scotch vinyl electrical tape as manufactured by 3M.

2.04 LUBRICANT Use lubricant where the possibility of damage to conductors exists. Use only a lubricant approved by the cable manufacturer and one which is compatible with cable and raceways and will not damage the insulating properties of the conductor.

PART 3 EXECUTION

3.01 WIRE AND CABLE

A. Provide a complete system of conductors in raceway system. All conductors of all systems shall be new and shall be installed in a raceway system.

B. The minimum size conductor permitted for power circuits is 12 AWG. For branch circuits whose length from panel to furthest outlet exceeds 70 feet for 120-volt circuits or 150 feet for 240-volt circuits use the next largest size conductor. For feeder circuits exceeding 200 feet in length voltage drop calculations are to be performed by the contractor prior to installation of the cable. Any circuits that exceed two (2) percent voltage drop shall have the size of the circuit conductors increased to reduce voltage drop below the 2% level. For branch circuits exceeding 100 feet in length voltage drop calculations are to be performed by the contractor prior to installation of the cable. Any circuits that exceed three (3) percent voltage drop shall have the size of the circuit conductors increased to reduce voltage drop below the 3% level.

C. Do not install wire in incomplete conduit runs or until after the concrete work and plastering is completed and moisture and construction debris is removed from conduits. Eliminate splices wherever possible. Where necessary, splice in readily accessible pull, junction, or outlet boxes.

D. Flashover or insulation value of joints shall be equal to that of the conductor. Provide Underwriters' Laboratories listed connectors rated to 600 volts for general use.

E. Use terminating fittings and connectors of a type suitable for the specified cable being used. Make bends in cable at termination points prior to installing connection device. Torque all bolted connections to the appropriate torque value for the connection being made.

3.02 INSTALLATION

A. General
   1. Provide tools, equipment, and materials to pull all wire and cable into place and to make required splices and termination.
   2. Do not exceed wire pulling tension limits specified by the cable manufacturer.
   3. On all conductors of 3 AWG size and larger perform insulation test at 1000 volts DC or as required by manufacturer specifications after installation. Provide test reports to the Engineer.

B. Wire and Cable in Conduit
   1. Utilize roller bearing swivel type pulling grips to prevent twisting of cable

being pulled.
2. Take precautions to avoid entrance of dirt and water into conduit and ducts.
3. Clean existing conduits and ducts to remove any pulling compound prior to pulling new cables.
4. Do not damage conductor insulation, braid jacket or sheath.
5. Do not bend conductors more than the manufacturer's recommended radius.
6. Make splices only in pull boxes, junction boxes and outlet boxes.
7. Utilize cable reels on jacks for pulling through pull boxes, ducts and conduits so bends will not be excessive and conductors will not touch sharp edges; use feeding tube where required.
8. For large diameter cables use properly sized pulling grips with a woven basket.
9. Do not exceed maximum recommended pulling tension of wire and cable.

C. Splices, Terminations, and Connections
1. Except where lugs are furnished with equipment, provide terminals and connectors suitable for quantity, conductor size and direction of entry (top or bottom).
2. Use insulated flanged terminals or Stacons for the connection of stranded conductors No. 12 AWG and smaller to device terminals.
3. Use compression type connectors for the installation of splices and connections No. 4 AWG and larger. Use a manufacturer's approved tool UL listed for the purpose and the correct die for the wire size and connector being installed.
4. Insulate the barrels of all butt splices and termination lugs and connectors with with four (4) layers of vinyl plastic tape or utilize connector manufacturer's insulating covers if provided.
5. Use mechanically attached bakelite covers over splices or taps only with approval of Owner's Representative. Provide deadfront protection for all uninsulated bus bars, connections, connectors or bare conductors.
6. Conductor Arcproofing
   a. Cover two or more power feeder cables occurring in the same switchboard section, junction box or pull box (including pull boxes over switchboards) with arcproof and flameproof tape or install insulating barriers between conductors.
   b. Provide tape "Scotch" Irvington Tape No. 7700 or Plymouth Rubber Co. Slipknot No. 30 to provide an insulation capable of withstanding a 200-amp arc for not less than 30 seconds.
   c. Apply tape in a single layer, half lapped, or as recommended by the manufacturer to conform to the above requirements.

3.03 FIELD QUALITY CONTROL

A. Testing
1. Test system wiring for continuity, grounds and short circuits prior to connection of any equipment. See "Testing Section".
2. Test final equipment connections for continuity of grounds and short circuits.
3. Perform insulation resistance test of feeders and subfeeders larger than # 3 AWG wire size or circuits 100 amperes or larger. Test with a megger at 1000 Volts DC for one (1) minute or as required by cable manufacturer specifications. Record results and furnish written results to the Engineer.
4. Correct faults and replace cable sections with faulty insulation. Repairs to insulation and splices in cable are to be made only in pull boxes or junctions boxes with the written approval of the Engineer. No repairs or splices are to be made inside any raceway. After repair demonstrate installation is free of grounds and short circuits and that insulation resistance complies with ICEA values.

END OF SECTION

SECTION 26 05 33

BOXES

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. The general provisions of the contract including General and Special Conditions and General Requirements shall apply to all work under this Section.

1.02 SCOPE OF WORK

A. Provide complete raceways systems, boxes and fittings for all electrical systems as required.

1.03 RELATED WORK CONTAINED IN OTHER SECTIONS

A. Related work in other sections:
   1. Electrical General Provisions Section 26 05 00.
   2. All other electrical specification sections.

PART 2 PRODUCTS

2.01 OUTLET, JUNCTION, AND PULL BOXES

A. Cast Type Conduit Boxes, Outlet Bodies and Fittings
   1. Provide surface mounted outlet and junction boxes, in indoor locations, where exposed to moisture and in outdoor locations.
   2. Use Ferrous Alloy boxes and conduit bodies with Rigid Steel or IMC.
   3. Use Ferrous Alloy or cast aluminum boxes and conduit bodies with Electrical Metallic Tubing.
   4. Covers: Cast or sheet metal unless otherwise required.
   5. Tapered threads for hubs.

B. Surface Pull and Splice Boxes, Outdoors
   1. Galvanized sheet steel sized and constructed in accordance with C.1.2. and 3. above with removable covers secured by brass machine screws.
   2. Where size of box is not indicated, size to permit pulling, racking, and splicing of the cables.
   3. Braze a ground connector suitable for copper cables to the inside of the box.

C. Below Grade and In-Ground Junction Box, Sidewalk Type
   1. Cast iron, hot-dipped galvanized with threaded conduit entrance hubs, flanged, reinforced checkered cover, gasketed with pry bar slots and countersunk stainless steel screws or Quazite or equal cast fiber epoxy box approved for the purpose.

PART 3 APPLICATION

3.01 OUTLET, JUNCTION, AND PULLBOXES

A. Provide outlet, junction, and pullboxes as indicated on the drawings and as required for the complete installation of the various electrical systems, and to facilitate proper pulling of wires and cables. J-boxes and pullboxes shall be sized per electrical code minimum. Boxes on empty conduit systems shall be sized based on the quantity, size and location of conduit entries.

B. The exact location of boxes, outlets and equipment is governed by structural components,

fixed building systems and obstructions, or other equipment items. When and as required relocate boxes and conduit to accommodate the fixtures or equipment installed or to be installed under other divisions of the Contract. It is the responsibility of the Contractor to verify final location of outlets, panels equipment, etc., with Architect before installation.

C. Where devices occur of different system voltages or where normal and emergency devices occur in same box a suitable barrier shall be installed.

D. Pull Box Spacing
   1. Provide pull boxes or the appropriate condulets so no individual conduit run contains more than the equivalent of four 90 degree bends (360 degrees total).
   2. For Conduit Sizes 1-1/4" and Larger.
      a. Provide boxes to prevent cable or wire from being excessively twisted, stretched, or kinked or bent during installation.
      b. Provide boxes for medium voltage cables so that maximum pulling tensions do not exceed the cable manufacturer's recommendations.
      c. Provide support racks for boxes with multiple sets of conductors so that conductors do not rest on any metal work inside box.
      d. As indicated on plans.

E. Plug any unused openings or knockouts in boxes with appropriate closing plates or plugs approved for the purpose.

F. Where metal tapping screws or any other types of fasteners, supports or braces that contain sharp edges or points that could damage conductor insulation have been used to assemble or mount boxes the Contractor shall file, grind or suitably eliminate the sharp points or edges before installation of conductors.

END OF SECTION

SECTION 26 05 35

ELECTRICAL RACEWAYS

PART 1 GENERAL

1.01 RELATED DOCUMENTS The general provisions of the contract including General and Special Conditions and General Requirements shall apply to all work under this Section.

1.02 SCOPE OF WORK Provide complete raceways systems, boxes and fittings for all electrical systems as required.

1.03 RELATED SECTIONS

A. Electrical, General Provisions Section 26 05 00.

B. All other electrical specification sections.

1.04 STANDARDS Comply with the most recent applicable provisions and latest recommendations of the following except as modified by governing codes and by the Contract Documents,:

1. Rigid Steel Conduit
   a. U.L. Standard UL-6
   b. A.N.S.I. C80-1
   c. Federal Specification WW-C-581E
2. Liquid Tight Flexible Conduit
   a. U.L. Standard UL-360
3.. Non-Metallic Conduit
   a. U.L. Standard UL-651
   b. A.N.S.I. Standard F512
   c. N.E.M.A. Standard TC-2
   d. Federal Specifications GSA-FSS and W-C-1094-A

1.05 SUBMITTALS

A. Provide manufacturer's catalog cuts of fittings.

B. Submit shop drawings or catalog data on boxes exceeding 2000 cubic inches in volume.

PART 2 PRODUCTS

2.01 RACEWAY TYPES

A. Standard Threaded Rigid Steel Conduit.
   1. Rigid conduit heavy wall galvanized.
   2. Threaded fittings
   3. Myers Hubs or equivalent watertight fittings at all enclosure connections.

B. Liquid Tight Flexible Electrical Conduit
   1. Galvanized flexible steel conduit with water-tight plastic outer jacket.
   2. Cast malleable iron, stainless steel or galvanized steel body and gland nut, cadmium plated one-piece grounding bushing threaded to interior of conduit. A molded vinyl, sealing ring installed between the gland nut and bushing and nylon insulated throat.

C. Non-Metallic Raceway
   1. Composed of schedule 40, sunlight resistant, gray, polyvinyl chloride suitable for 90 degrees C and manufactured in ten feet in lengths.

2. All joints shall be solvent cemented in accordance with the recommendations of the manufacturer.
3. All elbows shall be galvanized rigid steel sweeping type with bituminous coating.

2.02 LOCKNUTS AND BUSHINGS

A. Locknuts shall be galvanized steel.

B. All bushings shall be insulated. Nylon insulated metallic bushings with grounding lug shall be used for sizes 1" and larger. #6 ground to enclosure. Plastic bushings may be used in 1/2" and 3/4" sizes.

PART 3 EXECUTION

3.01 APPLICATION OF RACEWAYS Except as otherwise required by Code or modified by the drawings the following methods and applications shall be followed. Raceways not conforming must be removed by the Contractor and replaced with the specified material at the Contractors expense.

1. Rigid Steel Conduit- Application: Where subject to mechanical injury, where specifically required and where required by codes. PVC coated as indicated on plans.
2. Liquid-Tight Flexible Conduit - Applications: Use in areas exposed to moisture where flexible steel is unacceptable for connection to loads subject to movement and vibration.
3. Non-Metallic Conduit - Application: Schedule 40 – For underground feeders/circuits/signal cabling between Generator and Transfer switch and for electrical service entrance only. All elbows shall be made with galvanized rigid steel. NON-METALLIC CONDUIT IS NOT PERMITTED ABOVE GRADE.

3.02 GENERAL APPLICATION INSTRUCTIONS

A. Provide raceways for <u>all</u> wiring systems.

B. Wiring of each type and system must be installed in separate raceways. Emergency system wiring shall be installed in separate raceway from normal power wiring.

C. Provide grounding conductor in all raceways. Sizes as required by the Code or drawings.

D. Install caps on raceways as soon as installed and remove only when wires are pulled. Securely tie embedded raceway in place prior to embedment. Lay out the work in advance to avoid excessive concentrations of multiple raceway runs.

E. Locate raceways so that the structural integrity of other installations or strength of equipment rack framing members is unaffected and so as not to conflict with the services of other trades.

F. Draw up couplings and fittings full and tight.

H. Above-grade raceways shall comply with the following:

1. Route all raceways parallel or perpendicular to grade with right-angle turns and symmetrical bends. Raceway installed vertically shall be perpendicular (at a 90 degree angle) to a level horizontal plane.
2. Provide expansion fittings every 200 feet on outdoor conduit.
3. Provide a pull string in all spare or empty raceways. Allow three (3) feet of slack at each end and in each pull box. Secure each end so that it cannot be pulled into the raceway and place an identification tag on each end to identify the start and end points.
4. Support conduit using supports and fasteners approved for the purpose and per the National Electrical Code but at intervals not to exceed ten (10) feet with one

support within three (3) feet of each coupling, box, fitting, or outlet box. Provide one support within three (3) feet of each elbow or bend. Supports shall be galvanized and weather resistant intended for outdoor use.

5. Clear raceway of all obstructions and dirt prior to pulling in wires or cables.

I. Below Grade Raceways are to comply to the following:

1. Do not penetrate waterproof membranes unless proper seal is provided.
2. Protect steel raceway in earth or fill with two (2) coats of bitumen coating. Touch up abrasions and wrench marks after conduit is in place.

J. Non-metallic raceway installation shall conform to the following:

1. All joints are to be made using a solvent cement approved by the raceway manufacturer Components shall be cleaned prior to assembly.
2. Raceway cut-offs shall be square and made in such a manner as to not deform the conduit.
3. Raceway shall be reamed prior cementing to fittings.
4. Electrical devices which are served by PVC raceways shall be grounded by means of a ground wire pulled in the raceway.
5. Bends shall be made so as not to deform or damage the conduit. The radius of field bends shall not be less than those established by the N.E.C.
6. Expansion fittings shall be provided where necessary to prevent mechanical stress on the conduit and fittings.
7. PVC raceway supports shall be installed in such a manner to allow the conduit to slide through the supports as the temperature changes.
8. For PVC conduit runs exceeding fifty (50) feet in length or one (1) inch in size elbows must be galvanized rigid steel.
9. Clear raceway of all obstructions and dirt prior to pulling in wires or cables. Pull a ball mandrel with a diameter approximately 80% of conduit inside diameter followed by a close fitting wire brush or cloth swab ahead the cable being installed. All empty raceways shall be similarly cleaned. Clear and remove any objects in the raceway which restricts passage of the mandrel.
10. Support exposed PVC raceway at intervals no greater than five (5) feet for horizontal runs of less that 1-1/2” inside diameter. Support all other raceway runs at intervals not to exceed ten (10) feet with one support within three (3) feet of each coupling, box, fitting, or outlet box. Provide one support within three (3) feet of each elbow or bend.
11. All PVC conduit installed below grade shall be a minimum one (1) inch inside diameter.

END OF SECTION

SECTION 26 24 00

ELECTRICAL RACEWAYS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Furnish and install panelboard(s) as specified herein and where shown on the associated schedules and drawings.

1.02 SCOPE OF WORK

A. This section specifies the furnishing, installation and connection low voltage panelboards.

1.03 RELATED SECTIONS

A. Related work in other sections includes
   1. Electrical, General Provisions Section 16010.

1.04 STANDARDS

The panelboard(s) and circuit breaker(s) referenced herein are designed and manufactured according to the latest revision of the following specifications.

A. NEMA PB 1 - Panelboards

B. NEMA PB 1.1 - Instructions for Safe Installation, Operation and Maintenance of Panelboards Rated 600 Volts or Less.

C. NEMA AB 1 - Molded Case Circuit Breakers

D. NEMA KS 1 - Enclosed and Miscellaneous Distribution Equipment Switches (600 Volts Maximum)

E. UL 50 - Enclosures for Electrical Equipment

F. UL 67 - Panelboards

G. UL 98 - Enclosed and Dead-front Switches

H. UL 489 - Molded-Case Circuit Breakers and Circuit Breaker Enclosures

J. Federal Specification W-P-115C - Type I Class 1

K. Federal Specification W-C-375B/Gen - Circuit Breakers, Molded Case, Branch Circuit And Service.

L. ASTM - American Society of Testing Materials

1.05 SUBMITTAL AND RECORD DOCUMENTATION

A. Approval documents shall include drawings. Drawings shall contain overall panelboard dimensions, interior mounting dimensions, and wiring gutter dimensions. The location of the main, branches, and solid neutral shall be clearly shown. In addition, the drawing shall illustrate one line diagrams with applicable voltage systems.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Inspect and report concealed damage to carrier within their required time period.

B. Handle carefully to avoid damage to panelboard internal components, enclosure, and finish.

C. Store in a clean, dry environment. Maintain factory packaging and, if required, provide an additional heavy canvas or heavy plastic cover to protect enclosure(s) from dirt, water, construction debris, and traffic.

1.07 OPERATIONS AND MAINTENANCE MATERIALS

A. Manufacturer shall provide installation instructions and NEMA Standards Publication PB 1.1 - Instructions for Safe Installation, Operation and Maintenance of Panelboards Rated 600 Volts or Less.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Square D or equivalent by GE, Eaton, Siemens. Others with prior approval of Engineer only.

2.02 PANELBOARD TYPE

A. Interior
   1. Continuous main current ratings, as indicated on plans.
      Minimum Short Circuit Rating: 22k AIC or as indicated on drawings. Electrical Contractor shall be responsible for verifying with Utility prior to ordering.
   2. Provide one (1) continuous bus bar per phase. Each bus bar shall have sequentially phased branch circuit connectors limited to bolt-on branch circuit breakers. The bussing shall be fully rated. Panelboard bus current ratings shall be determined by heat-rise tests conducted in accordance with UL 67. Bussing rated 100-400 amperes shall be plated copper. Bus bar plating shall run the entire length of the bus bar.
   3. All current-carrying parts shall be insulated from ground and phase-to-phase by high dielectric strength thermoplastic.
   4. A solidly bonded equipment ground bar shall be provided. An additional isolated/insulated ground bar shall also be provided when required by drawings.
   5. Split solid neutral shall be plated and located in the mains compartment up to 250 amperes so all incoming neutral cable may be of the same length. Interior trim shall be of dead-front construction to shield user from energized parts. Dead-front trim shall have pre-formed twistouts covering unused mounting space.
   6. Interiors shall be field convertible for top or bottom incoming feed. Main lug interiors up to 400 amperes shall be field convertible to main breaker. Interior leveling provisions shall be provided for flush mounted applications.
   7. Interior phase bus shall be pre-drilled to accommodate field installable options. (i.e., Sub-Feed Lugs, Sub-Feed Breakers, Thru-Feed Lugs)
   8. Interiors shall accept 125 ampere breakers in group mounted branch construction. For power distribution panels, 400A.

B. Branch Circuit Breakers
   1. Circuit breakers shall be UL Listed with amperage ratings and number of poles as indicated on the panelboard on drawings.
   2. Molded case branch circuit breakers shall have bolt-on type bus connectors.
   3. Circuit breakers shall have an overcenter toggle mechanism which will provide quick-make, quick-break contact action. Circuit breakers shall have thermal and

magnetic trip elements in each pole. Two- and three-pole circuit breakers shall have common tripping of all poles.

4. The exposed faceplates of all branch circuit breakers shall be flush with one another.
5. Lugs shall be UL Listed to accept solid or stranded copper and aluminum conductors. Lugs shall be suitable for 90° C rated wire, sized according to the 75° C temperature rating per NEC Table 310-16.
6. Breakers shall be UL Listed for use with the following factory installed accessories: Shunt Trip, Auxiliary Switch, and Alarm Switch.
7. Breaker shall be UL Listed with the following ratings: (15-125A) Heating, Air Conditioning, and Refrigeration (HACR), (15-30A) High Intensity Discharge (HID), and (20A) Switch Duty (SWD)
8. Interrupting rating shall be minimum 22k AIC unless otherwise noted.

C. Enclosures

1. Type 3R
   a. Enclosures shall be constructed in accordance with UL 50 requirements. Enclosures shall be painted with ANSI medium gray enamel electrodeposited over cleaned phosphatized steel.
   b. All doors shall be gasketed and equipped with a tumbler type vault lock and two (2) additional quarter turn fasteners on enclosures 59 inches or more in height. All lock assemblies shall be keyed alike. One (1) key shall be provided with each lock. A clear plastic directory card holder shall be mounted on the inside of door.
   b. Maximum enclosure dimensions shall not exceed 9.5” deep.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install panelboards in accordance with manufacturer's written instructions, NEMA PB 1.1 and NEC standards.

B. Adjust trip settings as indicated in Coordination Study.

3.02 FIELD QUALITY CONTROL

A. Inspect complete installation for physical damage, proper alignment, anchorage, and grounding.

B. Inspect/test as required in Section 26 05 00.

END OF SECTION

SECTION 26 28 16

DISCONNECT SWITCHES – HEAVY DUTY

PART 1 GENERAL

1.01 SCOPE OF WORK

A. Switches shall be furnished and installed at locations as shown on the drawings. Switches shall be of the type approved, indicated and specified herein.

1.02 RELATED SECTIONS

A. The Electrical Contractor shall refer to other specification sections and drawings to ascertain the extent of work included. This shall include, but not be limited to, the following:

1. All provisions of the contract, including General Provisions and Special Provisions apply to the work specified in this section.
2. All electrical specifications.

1.03 REFERENCES AND STANDARDS

A. Switches shall be manufactured in accordance with the following standards:

1. UL 98 - Enclosed and Dead Front Switches
2. NEMA KS 1 - Enclosed Switches
3. NEMA 250 - Enclosures for Electrical Equipment

1.04 SUBMITTALS

A. Provide outline drawings with dimensions, and equipment ratings for voltage, amperage, horsepower and short circuit.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Switches shall be by Square D, Eaton, General Electric or Siemens.

2.02 SWITCH INTERIOR

A. All switches shall have switch blades which are visible when the switch is OFF and the cover is open.

B. Lugs shall be front removable and UL Listed for 75 degrees C conductors, aluminum or copper conductors. Fuse per equipment requirements, coordinate with other trades.

C. All current carrying parts shall be plated to resist corrosion.

D. Switches shall have removable arc suppressors to facilitate easy access to line side lugs.

E. Switches shall have provisions for a field installable electrical interlock.

2.03 SWITCH MECHANISM

A. Switch operating mechanism shall be quick-make, quick-break such that, during normal operation of the switch, the operation of the contacts shall not be capable of being restrained by the operating handle after the closing or opening action of the contacts has

started.

B. The operating handle shall be an integral part of the box, not the cover, provisions for padlocking the switch in the OFF position with at least three padlocks shall be provided.

C. All switches shall have a dual cover interlock mechanism to prevent unintentional opening of the switch cover when the switch is ON and prevent turning the switch ON when the cover is open. The cover interlock mechanism shall have an externally operated override but the override shall not permanently disable the interlock mechanism. The tool used to override the cover interlock mechanism shall not be required to enter the enclosure in order to override the interlock.

2.04. SWITCH ENCLOSURES

A. The enclosure shall have ON and OFF markings stamped into the cover.

B. All switches shall have provisions to accept up to three 3/8 in hasp padlocks to lock the operating handle in the OFF position.

C. Switch enclosure shall be the type as required by the plans and installed conditions.

D. All switches shall be NEMA 3R.

2.05 SWITCH RATINGS

A. Switches shall be horsepower rated for ac and/or dc as indicated on the plans.

B. Switch short circuit ratings shall be no less than 35k AIC.

C. Switch shall be heavy duty type and fusible.

D. Switch shall be service entrance rated where indicated on plans.

PART 3 EXECUTION

A. Coordinate switch mounting with field conditions to maintain all NEC required clearances.

END OF SECTION

SECTION 26 56 68

EXTERIOR ATHLETIC LIGHTING

PART 1 – GENERAL

1.1 SUMMARY

A. Work covered by this section of the specifications shall conform to the contract documents, engineering plans as well as state and local codes.

B. The purpose of these specifications is to define the performance and design standards for Newberry Recreation Complex. The manufacturer/contractor shall supply lighting equipment to meet or exceed the standards set forth in these specifications.

C. The sports lighting will be for the following venues:
   1. Baseball Fields 2 & 3
   2. Soccer Fields 1 & 2
   3. Alternate #5 – Baseball Field 1

D. The primary goals of this sports lighting project are:
   1. Light Levels: Selection of appropriate light levels impact the safety of the players and the enjoyment of spectators. Therefore, light levels shall be designed to not drop below specified target values for a period of 10 years.
   2. Life-cycle Cost: In order to reduce the operating budget, the preferred lighting system shall be energy efficient and cost effective to operate.
   3. Environmental Light Control: It is the primary goal of this project to minimize spill light to adjoining properties and glare to the players and spectators.

1.2 LIGHTING PERFORMANCE

A. **Performance Requirements:** Playing surfaces shall be lit to an average target illumination level and uniformity as specified in the chart below. Lighting calculations shall be developed and field measurements taken on the grid spacing with the minimum number of grid points specified below. Average illumination level shall be measured in accordance with the IESNA LM-5-04 (IESNA Guide for Photometric Measurements of Area and Sports Lighting Installations). Illumination levels shall not to drop below desired target values in accordance to IES RP-6-15, Page 2, Maintained Average Illuminance hours of usage shall comply with the following:

Area of Lighting	Annual Usage Hours	10 Year Usage Hours
Baseball Fields 2 & 3	300	3,000
Alternate Baseball Field 1	300	3.000
Soccer Fields 1-2	300	3,000

B. **Mounting Heights**: To ensure proper aiming angles for reduced glare and to provide better playability, minimum mounting heights shall be as specified on published plans. Higher mounting heights may be required based on photometric report and ability to ensure the top of the field angle is a minimum of 10 degrees below horizontal.

C. **Lighting Methodology:** There are two methods that will be considered for calculation of the lighting designs for this project. The approved Lighting Method #1 (Musco approved system), automated timed power adjustments, as described in C.1 utilizes methodology that adjusts light levels through a series of programmed adjustments. The alternate Lighting Method #2 (Non-Musco approved system), continuous depreciating light, as described in C.2 uses continuous lamp lumen depreciation which is recovered by relamping and cleaning lenses of the luminaires. Computer models shall reflect initial design lumens, end of life design lumens, recoverable light loss factor (RLLF), and the Coefficient Utilization (CU) for the design. Both methods must be at or above target illumination levels throughout the 10 years. A +/- 10% design/testing allowance is **not** permitted in the design logic.

1. **(Base Bid) Lighting Method #1: Automated Timed Power Adjustments:**

   a. Approved Musco's Green Generation Lighting® sports lighting system or equal shall use automated timed power adjustments to achieve a lumen maintenance control strategy as described in the IESNA Lighting Handbook 10th Edition, Lighting Controls Section page 16-8: "Lumen maintenance involves adjusting lamp output over time to maintain constant light output as lamps age and dirt accumulation reduces luminaire output. With lumen maintenance control, either lamps are dimmed when new, or the lamp's current is increased as the system ages."

   b. Manufacturers, not pre-approved, bidding an automated timed power adjustment system must provide an independent test report certifying the system meets the lumen maintenance control strategy above and verifying the field performance of the system for the duration of the useful life of the lamp based on lamp replacement hours. Report shall be signed by a licensed professional engineer with outdoor lighting experience. If report is not provided at least 10 days prior to bid opening, the manufacturer shall provide the initial and maintained designs called for in this specification under Lighting Method #2: Alternate Manufacturers, section 1.2.C.2.

   c. Project References: Non-approved manufacturers bidding any form of Automated Timed Power Adjustment light system must provide a minimum of ten (10) project references within the state of South Carolina that have been completed within the last 12 months utilizing this exact technology. Manufacturer will include project name, project city, and if requested, contact name and contact phone number for each reference.

Area of Lighting	Average Target Illumination Levels	Maximum to Minimum Uniformity Ratio	Grid Points	Grid Spacing
Baseball Fields 2-3 (Infield) & Alternate 1	30 foot-candles	2.5:1.0	25	30'x30'
Baseball Fields 2-3 (Outfield) & Alternate 1	20 foot-candles	3.0:1.0	125	30'x30'
Soccer Fields 1-2	20 foot-candles	3.0:1.0	40	30'x30'

2. **(Base Bid) Lighting Method #2 – Continuous Depreciating Light (Non-Musco):**

   a. The manufacturer bidding Lighting Method #2 must provide a complete submittal package for approval as outlined in Submittal Information at the end of this section at least 10 days prior to bid.

   b. The lighting system shall use continuous lamp lumen depreciation which is recovered by relamping and cleaning lenses of the luminaires. Manufacturer shall provide computer models for initial illumination level and target illumination levels on the field over 10 years. The specified maximum Recoverable Light Loss Factor (RLLF) of .7 and maintenance/group relamping schedule shall be provided in accordance with recommendations in the Leukos Abstract Volume 6, Number 3, January 2010, page 183-201: "Light Loss Factors for Sports Lighting", and presented at the 2009 IESNA Annual Conference.

1500w Luminaire RLLF Requirements

Lamp Replacement Interval (hours)	Recoverable Light Loss Factor (RLLF)
2,100	.69

   c. Independent Test Report: If lamp replacement interval is greater than 3,000 hours for 1500 watt lamps, manufacturer shall supply an independent test report with lumen depreciation over proposed lamp life, initial lumens, and end of life lumens.

Area of Lighting	Average Initial Illumination Levels	Average Target Illumination Levels	Maximum to Minimum Uniformity Ratio	Grid Points	Grid Spacing
Baseball Fields 2-3 (Infield) & Alternate 1	42.8 foot-candles	30 foot-candles	2.5:1.0	25	30'x30'
Baseball Fields 2-3 (Outfield) & Alternate 1	28.6 foot-candles	20 foot-candles	3.0:1.0	125	30'x30'
Soccer Fields 1-2	28.6 foot-candles	20 foot-candles	3.0:1.0	40	30'x30'

d. Revised Electrical Distribution: Manufacturer shall provide revised electrical distribution plans to include changes to service entrance, panel, and wire sizing if increased power is required which exceeds specified design loads.

1.3 LIFE CYCLE COSTS

Manufacturer shall submit 10-year life cycle cost calculation as outlined in the required submittal information.

Lamp replacement schedule per charts below:

Lighting Method 1 Lamp Replacement	Lighting Method 2 Lamp Replacement
5,000 hour intervals	2,100 hour intervals

PART 2 – PRODUCT

2.1 SPORTS LIGHTING SYSTEM CONSTRUCTION

A. Manufacturing Requirements: All components shall be designed and manufactured as a system. All luminaires, wire harnesses, ballast and other enclosures shall be factory assembled, aimed, wired and tested.

B. Durability: All exposed components shall be constructed of corrosion resistant material and/or coated to help prevent corrosion. All exposed carbon steel shall be hot dip galvanized per ASTM A123. All exposed aluminum shall be powder coated with high performance polyester or anodized. All exterior reflective inserts shall be anodized, coated, and protected from direct environmental exposure to prevent reflective degradation or corrosion. All exposed hardware and fasteners shall be stainless steel of 18-8 grade or better, passivated and coated with aluminum-based thermosetting epoxy resin for protection against corrosion and stress corrosion cracking. Structural fasteners may be carbon steel and galvanized meeting ASTM A153 and ISO/EN 1461 (for hot dipped galvanizing), or ASTM B695 (for mechanical galvanizing). All wiring shall be enclosed within the cross-arms, pole, or electrical components enclosure.

C. System Description: Lighting system shall consist of the following:
   1. Galvanized steel poles and cross arm assemblies.
   2. Non-approved pole technology:
      a. Direct bury steel poles which utilize the extended portion of the steel shaft for their foundation will not be accepted due to potential for internal and external corrosive reaction to the soils and long-term performance concerns.
   3. Pre-stressed concrete base embedded in concrete backfill allowed to cure for 12-24 hours before pole stress is applied. Alternate may be an anchor bolt foundation designed such that the steel pole and any exposed steel portion of the foundation is located a minimum of 18 inches above final grade. The concrete for anchor bolt foundations shall be allowed to cure for a minimum of 28 days before the pole stress is applied unless shorter cure time approved by structural engineer of record.
   4. All luminaires shall be constructed with a die-cast aluminum housing or external hail shroud to protect the luminaire reflector system.

5. Manufacturer will remote all ballasts and supporting electrical equipment in aluminum enclosures mounted approximately 10 feet above grade. The enclosures shall be touch-safe and include ballast, capacitor and fusing with indicator lights on fuses to notify when a fuse is to be replaced for each luminaire. Disconnect per circuit for each pole structure will be located in the enclosure. Integral ballast fixtures will not be accepted.
6. Wire harness complete with an abrasion protection sleeve, strain relief and plug-in connections for fast, trouble-free installation.
7. All luminaires, visors, and crossarm assemblies shall withstand 150 mph winds and maintain luminaire aiming alignment
8. Lighting Contactor Cabinet shall be provided . Cabinet shall be constructed of aluminum and be rated NEMA Type 4. Cabinet shall contain custom configured contactor modules for 30, 60, and 100 amps, labeled to match field diagrams and electrical design. Manual off-on-auto selector switches shall be provided.
9. Lightning Protection: Manufacturer shall provide integrated lightning grounding via concrete encased electrode grounding system as defined by NFPA 780 and be UL Listed per UL 96 and UL 96A. If grounding is not integrated into the structure, the manufacturer shall supply grounding electrodes, copper down conductors, and exothermic weld kits. Electrodes and conductors shall be sized as required by NFPA 780. The grounding electrode shall be minimum size of 5/8 inch diameter and 8 feet long, with a minimum of 10 feet embedment. Grounding electrode shall be connected to the structure by a grounding electrode conductor with a minimum size of 2 AWG for poles with 75 feet mounting height or less, and 2/0 AWG for poles with more than 75 feet mounting height.

D. Safety: All system components shall be UL listed for the appropriate application.

2.2 ELECTRICAL

A. Electric Power Requirements for the Sports Lighting Equipment:
   1. Electric power: ____ Volt, _____ Phase
   2. Maximum total voltage drop: Voltage drop to the disconnect switch located on the poles shall not exceed three (3) percent of the rated voltage.

B. Energy Consumption: The average kW consumption for the field lighting system shall be 55 kW. The max kW consumption for the field lighting system shall be 60 kW.

C. Revised Electrical Distribution: Manufacturer shall provide, at their cost, revised electrical distribution plans to include changes to service entrance, panel, and wire sizing if using Lighting Method 2.

2.3 STRUCTURAL PARAMETERS

A. Wind Loads: Wind loads shall be based on the 2012 International Building Code. Wind loads to be calculated using ASCE 7-10, an ultimate design wind speed of 115MPH and exposure category C.

B. Pole Structural Design: The stress analysis and safety factor of the poles shall conform to 2009 AASHTO Standard Specification for Structural Supports for Highway Signs, Luminaires, and Traffic Signals (LTS-5).

C. Foundation Design: The foundation design shall be based on soil parameters as outlined in the geotechnical report. If no geotechnical is available: the foundation design shall be based on soils that meet or exceed those of a Class 5 material as defined by 2012 IBC Table 1806.2.

D. Foundation Drawings: Project specific foundation drawings stamped by a registered engineer in the state where the project is located are required. The foundation drawings must list the moment, shear (horizontal) force, and axial (vertical) force at ground level for each pole. These drawings must be submitted at time of bid to allow for accurate pricing.

PART 3 – EXECUTION

3.1 SOIL QUALITY CONTROL

A. It shall be the Contractor's responsibility to notify the Owner if soil conditions exist other than those on which the foundation design is based, or if the soil cannot be readily excavated. Contractor may issue a change order request / estimate for the Owner's approval / payment for additional costs associated with:

1. Providing engineered foundation embedment design by a registered engineer in the State of South Carolina for soils other than specified soil conditions;
2. Additional materials required to achieve alternate foundation;
3. Excavation and removal of materials other than normal soils, such as rock, caliche, etc.

3.2 DELIVERY TIMING

Delivery Timing Equipment On-Site: The equipment must be on-site 4-6weeks from receipt of approved submittals and receipt of complete order information.

3.3 FIELD QUALITY CONTROL

A. Illumination Measurements: Upon substantial completion of the project and in the presence of the Contractor, Project Engineer, Owner's Representative, and Manufacturer's Representative, illumination measurements shall be taken and verified. The illumination measurements shall be conducted in accordance with IESNA LM-5-04. For Lighting Method 1, Timed Power Adjustment systems, light levels must be measured and exceed the specified target levels. For Lighting Method 2, light levels must be measured and meet the specified initial light levels.

B. Field Light Level Accountability
1. Light levels shall not to fall below the target maintained light levels for the entire 10 years.
2. The contractor/manufacturer shall be responsible for an additional inspection one year from the date of commissioning of the lighting system and will utilize the owner's light meter in the presence of the owner.
3. The contractor/manufacturer will be held responsible for any and all changes needed to bring these fields back to compliance for light levels and uniformities. Contractor/Manufacturer will be held responsible for any damage to the fields during these repairs.

C. Correcting Non-Conformance: If, in the opinion of the Owner or his appointed Representative, the actual performance levels including footcandles and uniformity ratios are not in conformance with the requirements of the performance specifications and submitted information, the Manufacturer shall be required to make adjustments to meet specifications and satisfy Owner.

3.4 10-YEAR WARRANTY

A. Each manufacturer shall supply a signed warranty covering the entire system, excluding fuses and lamps, for 10 years. Labor shall be included for 2 years. Lamps shall be warranted for 2 years for parts, and 1 year for labor. Warranty may exclude fuses, storm damage, vandalism, abuse and unauthorized repairs or alterations.

PART 4 – DESIGN APPROVAL

4.0 PRE-BID SUBMITTAL REQUIREMENTS (Non-Musco)

A. Design Approval: The owner / engineer will review pre-bid submittals per section 4.0.B from all the manufacturers to ensure compliance to the specification 10 days prior to bid. If the design meets the design requirements of the specifications, a letter and/or addendum will be issued to the manufacturer indicating approval for the specific design submitted.

B. Listed Manufacturers:
1. Method 1: Time Powered Adjustment Technology - Musco's Green Generation Lighting® sports lighting system or equal with a metal halide light source is the listed "Lighting Method 1" product.
2. Method 2: Continuous Depreciating Light – Manufacturers bidding "Lighting Method 2" product must submit for pre-bid approval.

C. All listed manufacturers not pre-approved shall submit the information at the end of this section at least 10 days prior to bid. An addendum will be issued prior to bid; listing approved lighting manufacturers and the design method to be used.

D. Bidders are required to bid only products that have been approved by this specification or addendum by the owner or owner's representative. Bids received that do not utilize an approved system/design, will be rejected.

REQUIRED SUBMITTAL INFORMATION FOR ALL MANUFACTURERS (NOT PRE-APPROVED) 10 DAYS PRIOR TO BID

All items listed below are mandatory, shall comply with the specification and be submitted according to pre-bid submittal requirements. Complete the Yes/No column to indicate compliance (Y) or noncompliance (N) for each item. ***Submit checklist below with submittal.***

Submitting as: ☐ ***HID Lighting Method 1*** ☐ ***HID Lighting Method 2***

Yes/ No	Tab	Item	Description
	A	Letter/ Checklist	Listing of all information being submitted must be included on the table of contents. List the name of the manufacturer's local representative and his/her phone number. Signed submittal checklist to be included.
	B	Equipment Layout	Drawing(s) showing field layouts with pole locations
	C	On Field Lighting Design	Lighting design drawing(s) showing: a. Field Name, date, file number, prepared by b. Outline of field(s) being lighted, as well as pole locations referenced to the center of the field (x & y), Illuminance levels at grid spacing specified c. Pole height, number of fixtures per pole, as well as luminaire information including wattage, lumens and optics d. Height of light test meter above field surface. e. Summary table showing the number and spacing of grid points; average, minimum and maximum illuminance levels in foot candles (fc); uniformity including maximum to minimum ratio, coefficient of variance (CV), coefficient of utilization (CU) uniformity gradient; number of luminaries, total kilowatts, average tilt factor; light loss factor. f. Manufacturer's using Lighting Method 2 shall provide both initial and maintained light scans using a maximum recoverable right loss factor (RLLF) as specified in section 1.2.C.2 and shall be shown on lighting design.
	D	Photometric Report	Provide first page of photometric report for all luminaire types being proposed showing candela tabulations as defined by IESNA Publication LM-35-02. Photometric data shall be certified by laboratory with current National Voluntary Laboratory Accreditation Program or an independent testing facility with over 5 years experience.
	E	Performance Guarantee	Provide performance guarantee including a written commitment to undertake all corrections required to meet the performance requirements noted in these specifications at no expense to the owner. Light levels shall be designed to not fall below target levels for 10 year period.
	F	Structural Calculations	Pole structural calculations and foundation design showing foundation shape, depth backfill requirements, rebar and anchor bolts (if required). Pole base reaction forces shall be shown on the foundation drawing along with soil bearing pressures. Design must be stamped by a structural engineer in the state of South Carolina, if required by owner. (May be supplied upon award).
	G	Control System	Manufacturer of the control system shall provide written definition and schematics the control system.
	H	Electrical Distribution Plans	Manufacturer using Lighting Method 2 must include a revised electrical distribution plan including changes to service entrance, panels and wire sizing, signed by a licensed Electrical Engineer in the state of South Carolina.
	I	Warranty	Provide written warranty information including all terms and conditions..
	J	Independent Testing Report	a. Lighting Method 1 is to provide an independent test report certifying the system meets the lumen maintenance control strategy defined in Section 1.2.C.1.a, verifying the field performance of the system for the duration of the useful life of the lamp based on lamp replacement hours. Report shall be signed by a licensed professional engineer with outdoor lighting experience. b. If Manufacturer using Lighting Method 2 desires to provide a recoverable light loss factor other than specified in section 1.2.C.2, Independent field test report from licensed professional engineer will be required to substantiate the ability to maintain light levels in accordance with section 1.7-A of the specification. Both initial and maintained light scans must still be provided. Independent Engineer conducting the report must have no affiliation with the manufacturer and report must be based on actual testing data. Testing must be done on the system as a whole, not on individual

			components.
	K	Project References	Manufacturer to provide a list of ten projects where the technology and specific fixture proposed for this project has been installed in the state of South Carolina. Reference list will include project name, project city, installation date, and if requested, contact name and contact phone number. Manufacturer bidding Lighting Method 2 must supply independent test report if lamp life relamping projection is greater than 3000 hours.
	L	Product Information	Complete bill of material and current brochures/cut sheets for all product being provided.
	M	Delivery	Manufacturer shall supply an expected delivery timeframe from receipt of approved submittals and complete order information.
	N	Non-Compliance	Manufacturer shall list all items that do not comply with the specifications. If in full compliance, tab may be omitted.
	O	Life-cycle Cost Calculation	Document life-cycle cost calculations as defined in the specification. Identify energy costs for operating the luminaires. All costs should be based on 10 Years. (complete table below)

	10-year Life Cycle Operating Cost		**Lighting Method 1**	**Lighting Method 2**
a.	**Luminaire energy consumption** ___ luminaires x ____ kW demand per luminaire x __ kWh rate x 300 annual usage hours x 10 years			
	TOTAL 10-Year Life-cycle Operating Cost	=		

The information supplied herein shall be used for the purpose of complying with the specifications for Newberry Recreation Complex. By signing below I agree that all requirements of the specifications have been met and that the manufacturer will be responsible for any future costs incurred to bring their equipment into compliance for all items not meeting specifications and not listed in the Non-Compliance section.

Manufacturer: _____ **Signature:** _____

Contact Name: _____ **Date:** _____/_____/_____

Contractor: _____ **Signature:** _____

SECTION 31 00 00

EARTHWORK

PART 1 GENERAL

1.01 SCOPE

A. This Section includes earthwork and related operations, including, but not limited to dewatering, excavating all classes of material encountered, pumping, draining and handling of water encountered in the excavations, handling, storage, transportation and disposal of all excavated and unsuitable material, construction of fills and embankments, backfilling around structures, compacting, all sheeting, shoring and bracing, preparation of subgrades, surfacing and grading, and any other similar, incidental, or appurtenant earthwork operations which may be necessary to properly complete the work.

B. The Contractor shall provide all services, labor, materials, and equipment required for all earthwork and related operations, necessary or convenient to the Contractor, for furnishing complete work as shown on the Drawings or specified in these Contract Documents.

1.02 RELATED SECTIONS

A. Section 00 30 00 – Information Available to Bidders (Geotechnical Report attached as Appendix to this Section)

B. Section 01 45 29 – Testing Laboratory Services

C. Section 31 10 00 - Site Preparation

D. Section 31 22 00 – Grading

E. Section 31 22 16 - Excavation

E. Section 31 25 00 - Erosion and Sedimentation Control

1.03 GENERAL

A. The elevations shown on the Drawings as existing are taken from the best existing data and are intended to give reasonably accurate information about the existing elevations. They are not precise and the Contractor shall become satisfied as to the exact quantities of excavation and fill required.

B. Earthwork operations shall be performed in a safe and proper manner with appropriate precautions being taken against all hazards.

C. All excavated and filled areas for structures, trenches, fills, topsoil areas, embankments, and channels shall be maintained by the Contractor in good condition at all times until final acceptance by the Owner. All damage caused by erosion or other construction operations shall be repaired by the Contractor using material of the same type as the damaged material.

D. The Contractor shall control grading in a manner to prevent surface water from running into excavations. Obstruction of surface drainage shall be avoided and means shall be provided whereby storm water can be uninterrupted in existing gutters, other surface drains, or temporary drains. Free access must be provided to all fire hydrants and meters.

E. Tests for compaction and density shall be conducted by an independent testing laboratory

selected in accordance with Section 01 45 29 of these Specifications.

1. The soils testing laboratory is responsible for the following:

    a. Field compaction testing shall be based on using the maximum dry density determined by the Standard Proctor Compaction Test in accordance with ASTM D 698.

    b. Determination of in-place backfill density shall be done in accordance with ASTM D 1556, “Density and unit weight of Soil In Place by the Sand-Cone Method”, ASTM D 2937, “Density of Soil In Place by the Drive-Cylinder Method” or ASTM D 2922, “Density of Soil and Soil-Aggregate In Place by Nuclear Methods (Shallow Depth)”.

    c. Field density tests for each lift; one test for each 5,000 square feet of fill or minimum one test per lift.

    d. Inspecting and testing stripped site, subgrades and proposed fill materials.

2. Contractor's duties relative to testing include:

    a. Notifying laboratory of conditions requiring testing.

    b. Coordinating with laboratory for field testing.

    c. Providing representative fill soil samples to the laboratory for test purposes. Provide 50 pound samples of each fill soil.

3. Inspection

    a. Earthwork operations, suitability of excavated materials for fill and backfill, and placing and compaction of fill and backfill is subject to inspection. Engineer will observe earthwork operations.

    b. Foundations and shallow spread footing foundations are required to be inspected by an engineer to verify suitable bearing and construction.

F. All earthwork operations shall comply with the requirements of OSHA Construction Standards, Part 1926, Subpart P, Excavations, Trenching, and Shoring, and Subpart O, Motor Vehicles, Mechanized Equipment, and Marine Operations, and shall be conducted in a manner acceptable to the Engineer.

G. It is understood and agreed that the Contractor has made a thorough investigation of the surface and subsurface conditions of the site and any special construction problems which might arise as a result of nearby watercourses and floodplains. The Contractor shall be responsible for providing all services, labor, equipment, and materials necessary or convenient to the Contractor for completing the work within the time specified in these Contract Documents.

H. Safety

Perform all trench excavation and backfilling activities in accordance with the Occupational Safety and Health Act of 1970 (PL 91-596), as amended. The Contractor shall pay particular attention to the Safety and Health Regulations Part 1926, Subpart P “Excavation, Trenching & Shoring” as described in OSHA publication 2226.

PART 2 PRODUCTS

2.01 SOILS CLASSIFICATIONS

Bedding materials listed here include a number of processed materials plus the soil types defined according to the Unified Soil Classification System (USCS) in ASTM D 2487, Standard Method for Classification of Soils for Engineering Purposes. (See below for description of soil classification). These materials are grouped into five broad categories according to their suitability for this application:

A. Class I - Angular, 1/4 to 1 1/2 inches (6 to 40 mm) graded stone, including such as coral, slag, cinders, crushed shells and crushed stone. Note - The size range and resulting high voids ratio of Class I material make it suitable for use to dewater trenches during pipe installation. This permeable characteristic dictates that its use be limited to locations where pipe support will not be lost by migration of other embedment materials into the Class I material. When such migration is possible, the material's minimum size range should be reduced to finer than 1/4 inch (6 mm) and the gradation properly designed to limit the size of the voids.

B. Class II - Coarse sands and gravels with maximum particle size of 1 1/2 inch (40 mm), including variously graded sands and gravels containing small percentages of fines, generally granular and non-cohesive, either wet or dry. Soil Types GW, GP, SW and SP are included in this class. Note - Sands and gravels which are clean or borderline between clean and with fines should be included. Coarse-grained soils with less than 12% but more than 5% fines are neglected in ASTM D2487 and the USCS and should be included. The gradation of Class II material influences its density and pipe support strength when loosely placed. The gradation of Class II material influences its density and pipe support strength when loosely placed. The gradation of Class II material may be critical to the pipe support and stability of the foundation and embedment if the material is imported and is not native to the trench excavation. A gradation other than well graded, such as uniformly graded or gap graded, may permit loss of support by migration into void spaces of a finer grained natural material from the trench wall and foundation.

C. Class III - Fine sand and clayey (clay filled) gravels, including fine sands, sand-clay mixtures and gravel-clay mixtures. Soil Types SM, GC, SM, and SC are included in this class.

D. Class IV - Silt, silty clays and clays, including inorganic clays and silts of not to high plasticity and liquid limits. Soil Types MH, ML, CH, and CL are included in this class. Note- Caution should be used in the design and selection of the degree and method of compaction for Class IV soils because of the difficulty in properly controlling the moisture content under field conditions. Some Class IV soils with medium to high plasticity and with liquid limits greater than 50% (CH, MH, CH-MH) exhibit reduced strength when wet and should only be used for bedding, haunching and initial backfill in arid locations where the pipe embedment will not be saturated by ground water, rainfall and/or exfiltration from the pipeline system. Class IV soils with low to medium plasticity and with liquid limits lower than 50% (CL, ML, CL-ML) also require careful consideration in design and installation to control moisture content but need not be restricted in use to arid locations.

E. Class V - This class includes the organic soils OL, OH, and PT as well as soils containing frozen earth, debris, rocks larger than 1 1/2 inch (40 mm) in diameter, and other foreign materials. These materials are not recommended for bedding, haunching or initial backfill.

DESCRIPTION OF EMBEDMENT MATERIAL CLASSIFICATIONS

SOIL CLASS	SOIL TYPE	DESCRIPTION MATERIAL CLASSIFICATION
Class I Soils *	---	Manufactured angular, granular material, 3/4 to 1 1/2 inches (6 to 40 mm) size, including materials having regional significance such as crushed stone, or rock, broken coral, crushed slag, cinders, or crushed shells.
Class II Soil **	GW	Well-graded gravels and gravel-sand mixtures, little or no fines. 50% or more retained on No. 4 sieve. More than 95% retained on No. 200 sieve. Clean..
	GP	Poorly graded gravels and gravel-sand mixtures, little or no fines. 50% or more retained on No. 4 sieve. More than 95% retained on No. 200 sieve. Clean
	SW	Well-graded sands and gravely sands, little or no fines. More than 50% passes No. 4 sieve. More than 95% retained on No. 200 sieve. Clean.
	SP	Poorly graded sands and gravelly sand, little or no fines. More than 50% passes No. 4 sieve. More than 95% retained on No. 200 sieve. Clean.
Class III Soil ***	GM	Silty gravels, gravel-sand-silt mixtures. 50% or more retained on No. 200 sieve.
	GC	Clayey gravels, gravel-sand-clay mixtures. 50% or more retained on No. 4 sieve. More than 50% retained on No. 200 sieve.
	SM	Silty sands, sand-silt mixtures. More than 50% passes No. 4 sieve. More than 50% retained on No. 200 sieve.
	SC	Clayey sands, sand-clay mixtures. More than 50% passes No. 4 sieve. More than 50% retained on No. 200 sieve.
Class IV Soils	ML	Inorganic silts, very fine sands, rock flour, silty or clayey fine sands. Liquid limit 50% or less. 50% or more passes No. 200 sieve.
	CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays. Liquid limit 50% or less. 50% or more passes No. 200 sieve.
	MH	Inorganic silts, micaceous or diatomaceous fine sands or silts, elastic silts. Liquid limit greater than 50%. 50% or more passes No. 200 sieve.
	CH	Inorganic clays of high plasticity, fat clays. Liquid limit greater than 50%. 50% or more passes No. 200 sieve.
Class V Soils	OL	Organic silts and organic silty clays of low plasticity. Liquid limit 50% or less. 50% or less. 50% or more passes No. 200 sieve.

OH Organic clays of medium to high plasticity. Liquid limit 50% or less. 50% or more passes No. 200 sieve.

PT Peat, muck and other highly organic soils.

* Soils defined as Class I materials are not defined in ASTM D2487.
** In accordance with ASTM D2487, less than 5% pass No. 200 sieve.
*** In accordance with ASTM D2487, more than 12% pass No. 200 sieve. Soils with 5% to 12% pass No. 200 sieve fall in borderline classification, e.g. GP-GC.

2.02 FILL MATERIAL

A. Sand Fill: Material shall consist of a clean sand with a fineness modulus of 1.6 to 3.1 and containing not more than 10 percent by weight finer than No. 200 U.S. Standard Sieve.

B. Earth Fill: Material shall consist of inorganic material free of roots, cobbles and boulders and classified as SM, ML, SC, or CL by ASTM D2487-85 "Standard Methods for Classification of Soils for Engineering Purposes". Earth Fill shall also conform to the following:

1. Liquid Limit = 50 maximum

2. Plasticity Index = 20 maximum

3. Dry Unit Weight = 90 pcf minimum maximum density

2.03 UNSUITABLE SITE FILL MATERIAL

A. Material which does not conform to the above classifications (soil classification SP, SW, GM, CH, MH, OH, OL and PT) may be used as Site Fill material in areas identified on the drawings as "spoil areas", in areas with no structures and or roads and other non-critical areas.

2.04 SHEETING, BRACING AND TIMBERING

A. Sheeting, Bracing and Timbering: The Contractor shall furnish, place and maintain all sheeting, bracing and timbering required to properly support trenches and other excavations in open cut and to prevent all movement of the soil, pavement, structures, or utilities outside of the trench or pit.

1. General

a. Cofferdams and bracing design, including computations, shall be prepared before commencing construction operations. Drawings and design computations shall be signed and sealed by a Professional Engineer registered in the State of South Carolina. The drawings and design computations shall be submitted to the Engineer for informational purposes only.

b. Sheeting, bracing and timbering shall be so placed as to allow the work to be constructed to the lines and grades shown on the Drawings and as ordered by the Engineer.

c. If at any time the method being used by the Contractor for supporting any material or structure in or adjacent to any excavation is not reasonably safe, the Contractor shall provide additional bracing and support necessary to

furnish the added degree of safety.

d. All sheeting in contact with the concrete or masonry shall be cut off as directed by the Engineer and left in place.

2. Timber: Timber may be substituted for steel sheet piling when approved by the Engineer. Timber for shoring, sheeting or bracing shall be sound and free of large or loose knots, and in good condition. Size and spacing shall be in accordance with OSHA regulations.

3. Steel Sheet Piling: Steel sheet piling shall be the continuous interlock type. The weight, depth, and section modulus of the sheet piling shall be sufficient to restrain the loads of earth pressure and surcharge from existing foundations and/or live loads. Procedure for installation and bracing shall be so scheduled and coordinated with the removal of the earth that the ground under existing structures shall be protected against lateral movement at all times. The Contractor shall provide closure and sealing between sheet piling and existing facilities. Steel piling shall be removed, unless otherwise directed by the Engineer.

4. Remove bracing and sheeting in units when backfill reaches the point necessary to protect the structures and adjacent property. Leave sheeting in place when, in the opinion of the Engineer, it cannot be safely removed. Cut off sheeting left in place at least two feet below the surface.

2.05 FILTER FABRIC

A. Filter fabric associated with bedding shall be a UV stabilized, spunbonded, continuous filament, needle punched, polypropylene, nonwoven geotextile.

B. The fabric shall have an equivalent open size (EOS or AOS) of 120 - 70. The fabric shall also conform to the minimum property values listed in the following table:

Fabric Property	Unit	Test Procedure	Average Value	
			Typical	Minimum
Weight	oz/yd^2	ASTM D 3776	8.3	
Thickness	mils	ASTM D 1777	105	
Grab Strength	lbs.	ASTM D 4632	240	210
Grab Elongation	%	ASTM D 4632	>50	50
Tear Strength	lbs.	ASTM D 4533	100	85
Mullen Burst	psi	ASTM D 3786	350	320
Puncture Resistance	lbs.	ASTM D 4833	115	100
Permittivity	sec^{-1}	ASTM D 4491	1.7	
Water Permeability	cm/sec	ASTM D 4491	0.4	

Water Flow Rate	gpm/ft^2	ASTM D 4491	120	
UV Resistance (500 hrs)	%	ASTM D 4355	>85	
pH			2 – 13	

C. Filter fabric shall be Polyfelt TS 700, Trevira 1125 or SuPac 7-MP.

2.06 CONCRETE

Concrete for initial backfill or encasement shall have a compressive strength of not less than 3,000 psi, with not less than 5.5 bags of cement per cubic yard and a slump between 3 and 5-inches. Ready-mixed concrete shall be mixed and transported in accordance with ASTM C 94. Reinforcing steel shall conform to the requirements of ASTM A 615, Grade 60.

PART 3 EXECUTION

3.01 GENERAL

A. Safety: Comply with local regulations and with the provisions of the "Manual of Accident Prevention in Construction" of the Associated General Contractors of America, Inc., Occupational Safety and Health Act and all other applicable safety regulations.

B. Topsoil

1. Remove all topsoil to a depth at which subsoil is encountered, from all areas under buildings, pavements, and from all areas which are to be cut to lower grades or filled.

2. With the Engineer's approval, topsoil to be used for finish grading may be stored on the site.

3. Other topsoil may be used for fill in non-critical areas with approval of the Engineer.

4. Properly dispose of all excess topsoil in the designated area.

C. Bracing and Sheeting

1. Furnish, put in place, and maintain all sheeting, bracing, and shoring as may be required to properly support the sides of all excavations and to prevent all movement of earth which could in any way injure the work, adjacent property or workers.

2. Properly support all excavations where necessary to conform to all pertinent rules and regulations and these Specifications, even though, such locations are not indicated on the Drawings.

3. Exercise care in the removal of sheeting, shoring, bracing and timbering to prevent collapse or caving of the excavation faces being supported and damage to the work and adjacent property.

4. Do not leave any sheeting or bracing in the trench or excavation after completion of the work, unless approved by the Engineer.

D. Obstructions

1. Remove and dispose of all boulders, sidewalks, driveways, pavement, pipes, and the like, as required for the performance of the work.

2. Exercise care in excavating around catch basins, inlets and manholes so as to not disturb or damage these structures.

3. Avoid removing or loosening castings or pushing dirt into catch basins, inlets and manholes.

4. Damaged or displaced structures or casting shall be repaired, replaced and dirt entering the structures during the performance of the work shall be removed at no additional cost to the Owner.

E. Utilities to be Abandoned

1. When pipes, conduits, sewers, or other structures are removed from the trench, leaving dead ends in the ground, such ends shall be fully plugged or sealed with brick and non-shrink grout.

2. Abandoned structures such as manholes or chambers shall be entirely removed.

3. All materials from abandoned utilities shall be removed from the site.

4. All salvageable materials shall become the property of the Owner.

5. All equipment to be salvaged is noted in the Specifications and shall be turned over to the Owner at a designated location.

F. Extra Earth Excavation

1. In case soft or excessively wet material which, in the opinion of the Engineer, is not suitable, is encountered below the final subgrade elevation of an excavation or underneath a structure, the Engineer may order the removal of this material and its replacement with crushed stone, filter fabric, or other suitable material in order to make a suitable foundation for the construction of the structure.

G. Cutting Paved Surfaces and Similar Improvements

1. Remove existing pavement as necessary for installing pipe utilities and appurtenances or as otherwise shown on the Drawings.

2. Before removing any pavement, mark the pavement neatly, paralleling pipe lines and existing street lines. Space the marks the width of the trench.

3. Break asphalt pavement along the marks using rotary saws or other suitable tools. Break concrete pavement along the marks by use of scoring with a rotary saw and breaking below the score by the use of jackhammers or other suitable tools.

4. Do not pull pavement with machines until completely broken and separated from pavement to remain.

5. Do not disturb or damage the adjacent pavement. If the adjacent pavement is disturbed or damaged, remove and replace the damaged pavement. No additional payment will be made for removing and replacing damaged adjacent pavement.

6. Remove and replace sidewalks disturbed by construction for their full width and to the nearest undisturbed joint.

7. The Contractor may tunnel under curbs that are encountered. Remove and replace any curb disturbed by construction to the nearest undisturbed joint.

3.02 EXCAVATION

A. Method

1. All excavation shall be by open cut from the surface except as indicated on the Drawings.

2. All excavations for pipe appurtenances and structures shall be made in such a manner, and to such depth and width, as will give ample room for building the structures, and for bracing, sheeting, and supporting the sides of the excavation, for pumping and draining groundwater which may be encountered, and for the removal from the excavation of all materials excavated.

3. Take special care so that the soil below the bottom of the structure to be built is left undisturbed.

B. Grades: Excavate to grades indicated on the Drawings. Where excavation grades are not indicated on the Drawings, excavate as required to accommodate installation.

C. Disposal of Excavated Material

1. Remove and properly dispose of all excavated material not needed to complete filling, backfilling and grading.

2. Dispose of excess earth and rock excavated materials at locations on-site designated by the Engineer. Off-site disposal of all other material shall be and in accordance with all requirements of federal, state, county, and municipal regulations. No debris of any kind shall be deposited in any stream or body of water, or on any street. No debris shall be deposited on any private property, except by written consent of the property owner. In no case shall any material be shoved onto abutting private properties, or be buried in embankments or trenches on the Project.

3.03 EXCAVATING FOR STRUCTURES

A. Earth Excavation: Earth excavation shall include all substances to be excavated other than rock. Earth excavation for structures shall be to limits not less than two feet outside wall lines, to allow for formwork and inspection, and further as necessary to permit the trades to install their work. All materials loosened or disturbed by excavation shall be removed from surfaces to receive concrete or crushed stone.

B. Excavation for Foundations: Footings and slabs on grades shall rest on undisturbed earth, rock or compacted materials to insure proper bearing.

1. Unsuitable Foundation Material: Any material, in the opinion of the Engineer, which is unsuitable for foundation shall be removed and replaced with compacted crushed stone, or with compacted fill material as directed by the Engineer. No determination of unsuitability will be made until all requirements for dewatering are satisfactorily met.

2. Pipe Trenches Beneath Structures: Where piping or conduit passes beneath footings or slabs resting on grade, trenches shall be excavated to provide a

minimum 6-inch clearance from all surfaces of the pipe or conduit. The trench shall be backfilled to the base of the structure with concrete.

3. Unauthorized Excavation: Care shall be taken that excavation does not extend below bottom levels of footings or slabs on earth. Should the excavation, through carelessness or neglect, be carried below such levels, the Contractor shall fill in the resulting excess excavation with concrete under footings and compacted crushed stone or other approved material under slabs. Should excavation be carried beyond outside lines of footings such excess excavation shall be filled with concrete, or formwork shall be provided, as directed by the Engineer.

C. Unsuitable Bearing

1. If suitable bearings for foundations are not encountered at the elevations indicated on the Drawings, immediately notify the Engineer.

2. Do not proceed further until instructions are received.

3.04 DEWATERING REQUIREMENT

A. The Contractor may use any dewatering method he deems feasible so long as it results in working in the dry and stable soil conditions.

B. The Contractor shall conform and meet all conditions, obtain necessary permits and requirements of the regulatory agencies that have jurisdiction.

C. It is the intent of these specifications that an adequate dewatering system be installed to lower and control the groundwater in order to permit excavation, construction, grading and the placement of fill materials, all to be performed under dry conditions. The dewatering system shall be adequate to pre-drain the water-bearing strata above and below the bottom of the excavation.

D. The Contractor shall be solely responsible for the arrangement, location and depths of dewatering system necessary to accomplish the work described under this section of the specifications. The dewatering shall be accomplished in a manner that will reduce the hydrostatic head below any excavation to the extent that the water level in the construction area are a minimum of three (3) feet below the prevailing excavation surface and any surface to be compacted; will prevent the loss of fines, seepage, boils, quick conditions, or softening of the foundation strata; will maintain stability of the sides and bottom of the excavation; and will result in all construction operations being performed in the dry.

E. The Contractor shall promptly dispose of all water removed from the excavations in such a manner as will not endanger public health, damage public or private property, or affect adversely any portion of the work under construction or completed by him or any other Contractor. Contractor shall obtain written permission from the Owner for any property involved before digging ditches or constructing water courses for the removal of water.

F. The disposal of water from the dewatering system shall meet the requirements of all regulatory agencies having jurisdiction.

G. If the dewatering requirements are not satisfied due to inadequacy or failure of the dewatering system, then loosening of the foundation strata, or instability of the slopes, or damage to the foundations or structures may occur. The supply of all labor and materials, and the performance of all work necessary to carry out additional work for reinstatement of the structures of foundation soil resulting from such inadequacy or failure shall be undertaken by the Contractor subject to the approval of the Engineer, and at no

additional expense to the Owner.

3.05 COMPACTION

A. Fill materials supporting roadways, parking areas, sidewalks, structures, and buildings and backfill around structures shall be compacted to 95 percent of the standard proctor density. The top 12-inches of fill materials supporting structures or pavement shall be compacted to 98 percent of the standard proctor density. Fill placed for general site grading shall be compacted to 90 percent of the standard proctor density.

B. Compaction of embankments shall be by vibratory sheepsfoot or pad-foot rollers with staggered, uniformly spaced knobs and suitable cleaning devices. The projected area of each knob and the number and spacing of the knobs shall be such that the total weight of the roller and ballast when distributed over the area of one row of knobs shall be 250 psi. Placement and compaction of materials shall extend at least 5 feet beyond the final contours sufficiently to insure compaction of the material at the resulting final surface. Final contours shall then be achieved by a tracked bulldozer shaping the face of the embankment.

C. Compaction of backfill next to walls shall be accomplished with hand-powered tamping equipment. The backfill shall be placed in 8-inch maximum lifts, with each lift compacted to 95 percent of standard proctor density.

D. If tests indicate that density of fill is less than that specified, the area shall be, as directed by the Engineer, either recompacted or undercut, filled, and compacted until specified density is achieved.

3.07 FILL

A. Controlled Fill

1. The fill for roadways, parking areas, walks, structures, and building slabs on grade shall be controlled fill.

2. After the existing ground or excavated area has been proofrolled and examined by the Engineer, all holes and other irregularities shall be filled and compacted before the main fill is placed.

3. The fill shall be placed in even layers not exceeding 8-inches in depth and shall be thoroughly compacted as herein specified.

4. If an analysis of the soil being placed shows a marked difference from one location to another, the fill being placed shall not be made up of a mixture of these materials.

5. Each different type of material shall be handled continuously so that field control of moisture and density may be based upon a known type of material.

6. No fill shall be placed following a heavy rain without first making certain on isolated test areas that compaction can be obtained without damage to the already compacted fill.

B. Proofrolling

1. All areas where roadways, parking areas, sidewalks, structures, and buildings are to be constructed on cut areas, compacted fill, and other areas where indicated on the Drawings, shall be proofrolled to detect soft spots prior to the placement of fill material or building foundations.

2. Proofrolling shall be performed using a fully loaded tandem-axle dump truck 20 tons or other suitable pneumatic tired equipment over the subgrade before the subgrade is shaped.

3. Proofrolling shall be witnessed by the Engineer.

4. Subgrade shall be proofrolled with 10 overlapping passes of the roller. Depressions that develop during the proofrolling operation shall be filled with suitable material and those filled areas shall be proofrolled with six passes of the roller. If, after having been filled and proofrolled, the subgrade areas that still “pump” or “rut”, shall be further evaluated by a geotechnical engineer, and remedial work be determined based on the conditions found at locations under structures or pavement. The contractor shall execute remedial work determined by the geotechnical engineer to achieve a subgrade acceptable to the Engineer.

5. After the proofrolled subgrade has been accepted by the Engineer, the surface of the subgrade shall be finish rolled with a smooth steel wheel roller weighing not less than 10 tons. Finished surface of the subgrade shall be within a tolerance of 1/4-inch at every point.

6. Conduits, pipes, culverts, and underdrains shall be neither disturbed nor damaged by proofrolling operations. Rollers shall neither pass over, nor approach closer than five feet to, conduits, pipes, culverts, and underdrains unless the tops of those products are deeper than three feet.

C. Placement

1. Prior to placement of any material in embankments, the area within embankment limits shall be stripped of topsoil and all unsuitable materials removed in accordance with this Section. The area shall then be scarified to a depth of at least 6-inches.

2. Fill materials shall be placed in continuous, approximately horizontal layers extending the full width of the embankment cross-section and the full dimension of the excavation where practical and having an uncompacted thickness of not over 8-inches.

D. Final Grading: Upon completion of construction operations, the area shall be graded to finish contour elevations and grades shown on the Drawings. Graded areas shall be made to blend into conformation with remaining ground surfaces. All surfaces shall be left smooth and free to drain.

E. Excess Material: Surfaces and slopes of waste fills shall be left smooth and free to drain.

F. Moisture

1. Fill materials shall be placed at optimum moisture content within practicable limits, but not less or more than two percent of optimum. Optimum moisture shall be maintained by sprinkling the layers as placed or by allowing materials to dry before placement.

2. If fill material is too wet, provide and operate approved means to assist the drying of the fill until suitable for compaction.

3. If fill material is too dry, provide and operate approved means to add moisture to the fill layers.

3.08 BACKFILLING

A. Backfill carefully to restore the ground surface to its original condition. Dispose of excess material in accordance with this Section.

B. Compact backfill underlying roadways, parking areas, sidewalks, structures and buildings in accordance with the requirements of Article 3.06 of this Section.

C. Backfilling Around Structures

1. General

a. Remove debris from excavations before backfilling.

b. Do not backfill against foundation walls until so directed by the Engineer nor until all indicated perimeter insulation and/or waterproofing is in place.

c. Protect such insulation and/or waterproofing during filling operations.

d. Do not backfill against water retaining structures until successful leakage tests have been completed.

e. Wherever possible, backfilling shall be simultaneous on both sides of walls to equalize lateral pressures.

f. Do not backfill against walls until all permanent construction is in place to furnish lateral support on both top and bottom of wall.

g. Backfilling against walls shall take place after all the concrete in the affected members has attained the specified strengths.

h. To prevent excessive lateral pressure on external walls, large compaction equipment shall not be allowed within a zone wall footing.

2. Materials: Backfill material placed against structures built or encountered during the work of this Section shall be suitable fill material. No broken concrete, bricks or similar materials will be permitted as backfill.

3.09 GRADING

A. General: Perform all rough and finish grading required to attain the elevations indicated on the Drawings. Perform finish grading to an accuracy of $\pm$0.10 foot.

B. Treatment After Completion of Grading

1. After grading is completed, permit no further excavation, filling or grading, except with the approval of the Engineer.

2. Use all means necessary to prevent the erosion of freshly graded areas during construction and until such time as permanent drainage and erosion control measures have been installed.

3.09 SETTLEMENT

A. The Contractor shall be responsible for all settlement of backfill, fills and embankments which may occur within one year after final acceptance of the Work by the Owner.

B. The Contractor shall make, or cause to be made, all repairs or replacements made necessary by settlement within 30 days after receipt of written notice from the Engineer or Owner.

3.13 CLEAN-UP

A. Leave unused materials in a neat, compact stockpile.

B. Remove unused stockpiled materials, leave area in a clean and neat condition. Grade stockpile area to prevent standing surface water.

C. Leave borrow areas in a clean and neat condition. Grade to prevent standing surface water.

END OF SECTION

SECTION 31 10 00

SITE PREPARATION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Selective demolition of built site elements.

B. Clearing and protection of vegetation.

C. Removal of existing debris.

1.02 RELATED SECTIONS

A. Section 31 25 00 - Erosion and Sediment Control.

B. Section 01 74 00 - Waste Management: Limitations on disposal of removed materials; requirements for recycling.

C. Section 31 11 00- Clearing and Grubbing.

D. Section 31 22 00 – Grading.

E. Section 31 23 16 - Excavation.

F. Section 31 23 23.13 – Backfill and Compaction.

1.03 REFERENCES

A. 29 CFR 1926 - U.S. Occupational Safety and Health Standards; current edition.

B. NFPA 241 - Standard for Safeguarding Construction, Alteration and Demolition Operations; 2013.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Site Plan: Showing:

1. Vegetation removal limits.

2. Areas for temporary construction and field offices.

3. Areas for temporary and permanent placement of removed materials.

C. Project Record Documents: Accurately record actual locations of capped and active utilities and subsurface construction.

1.05 PROJECT CONDITIONS

A. Minimize production of dust due to demolition operations; do not use water if that will result in ice, flooding, sedimentation of public waterways or storm sewers, or other pollution.

B. Comply with other requirements specified in Section 01 73 00.

PART 2 PRODUCTS – NOT USED

PART 3 EXECUTION

3.01 EXISTING UTILITIES

A. Coordinate work with utility companies; notify before starting work and comply with their requirements; obtain required permits.

B. Protect existing utilities to remain from damage.

C. Do not disrupt public utilities without permit from authority having jurisdiction.

D. Do not close, shut off, or disrupt existing life safety systems that are in use without at least seven (7) days prior written notification to Owner.

E. Do not close, shut off, or disrupt existing utility branches or take-offs that are in use without at least three (3) days prior written notification to Owner.

F. Locate and mark utilities to remain; mark using highly visible tags or flags, with identification of utility type; protect from damage due to subsequent construction, using substantial barricades if necessary.

G. Remove exposed piping, valves, meters, equipment, supports, and foundations of disconnected and abandoned utilities.

H. Prepare building demolition areas by disconnecting and capping utilities outside the demolition zone; identify and mark utilities to be subsequently reconnected, in same manner as other utilities to remain.

3.02 VEGETATION

A. Scope: Remove trees, shrubs, brush, and stumps in areas to be improved.

B. Do not begin clearing until vegetation to be relocated has been removed.

C. Do not remove or damage vegetation beyond the following limits:

1. Limits of Disturbance as illustrated on Construction Drawings

2. 25 feet outside perimeter of pervious paving areas that must not be compacted by construction traffic.

3. Exception: Specific trees and vegetation indicated on drawings to be removed.

4. Exception: Selective thinning of undergrowth specified elsewhere.

D. In areas where vegetation must be removed but no construction will occur other than pervious paving, remove vegetation with minimum disturbance of the subsoil.

E. Vegetation Removed: Do not burn, bury, landfill or leave on site, except as indicated.

1. Chip, grind, crush, or shred vegetation for mulching, composting, or other purposes; preference should be given to on-site uses.

2. Trees: Sell if marketable; if not, treat as specified for other vegetation removed; remove stumps and roots to depth of 18 inches.

3. Existing Stumps: Treat as specified for other vegetation removed; remove stumps and roots to depth of 18 inches.

4. Sod: Re-use on site if possible; otherwise sell if marketable, and if not, treat as specified for other vegetation removed.

5. Fill holes left by removal of stumps and roots, using suitable fill material, with top surface neat in appearance and smooth enough not to constitute a hazard to pedestrians.

F. Dead Wood: Remove all dead trees (standing or down), limbs, and dry brush on entire site; treat as specified for vegetation removed.

G. Restoration: If vegetation outside removal limits or within specified protective fences is damaged or destroyed due to subsequent construction operations, replace at no cost to Owner.

3.03 DEBRIS

A. Remove debris, junk, and trash from site.

3.04 WASTE REMOVAL

A. Remove from site all materials not to be reused on site; comply with requirements of Section 01 74 00 - Waste Management.

B. Leave site in clean condition, ready for subsequent work.

C. Clean up spillage and wind-blown debris from public and private lands.

3.05 MEASUREMENT AND PAYMENT

A. No separate measurement or direct payment will be made for the work under this section and all costs for same shall be included in the overall lump sum bid for this project.

END OF SECTION

SECTION 31 11 00

CLEARING AND GRUBBING

PART 1 GENERAL

1.01 DESCRIPTION

A. Work included: Remove all organic vegetative mater as required to complete the construction as indicated on the construction plans.

B. Related work:

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

2. Section 01 71 23 - Field Engineering.

3. Section 31 10 00 - Site Preparation.

4. Section 01 41 00 – Demolition.

5. Section 31 25 00 - Erosion and Sedimentation Control.

6. Section 32 92 00 – Turf and Grasses.

1.02 QUALITY ASSURANCE

A. Use required number of workmen that are properly trained and have experience in the crafts and who are completely familiar with the specified requirements herein and the methods for proper performance of the work specified in this section.

B. Use the proper equipment that is adequate in size, capacity and numbers to accomplish the work within the timeframe of the Project schedule.

C. Comply with requirements of governmental agencies having jurisdiction within the Project area.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 AREA INCLUDED

A. All areas where new construction is taking place, or as illustrated on the plans.

3.02 PROCEDURES

A. Clearing and grubbing: The entire area within the limits described above shall be cleared and grubbed at a minimum depth of 6-inches.

B. Areas that are to be selectively cleared shall consist of removing vegetation, brush, stumps, etc., from the area. Special care shall be taken to avoid damage to trees that are left. Grubbing will not be required in areas designated for selective clearing.

C. Removal of trees and shrubs: All trees being taken down must be removed avoiding damage to trees and existing features that are to remain. All parts of the trees being removed are to be completely taken from the site and properly disposed of. Contractor at their discretion may grind trees and stumps for use as erosion control material along stockpile slopes and in between double row silt fence.Any shrubs or small trees that are undesirable may be selectively removed as directed.

D. Stumps and roots: All stumps and roots larger than 2-inches in diameter shall be completely removed by grubbing except in areas of building site, parking areas and drives; they must be cut off no less than 18-inches below any subgrade. The area of operation then shall be cleared of resulting debris and matted roots, weeds and other organic matter shall be hauled away from the site. Generally, all material that cannot be compacted to 90-percent maximum density in lawn areas and 95-percent of maximum density elsewhere must be removed.

E. Protection of trees: Trees that are to remain in place will need to be protected in areas where earthwork cut or fill is eighteen inches or less and in existing parking areas. Contractor must obtain approval from Engineer prior to removal of significant trees covered by local tree ordinances. Existing trees that are remaining in place during and after construction must be protected by constructing barricades around each tree.

F. Erosion and Sediment Control: Construct and maintain erosion and sediment control devices as illustrated on the construction plans and in accordance with Section 31 25 00 of these specifications.

3.03 MEASUREMENT AND PAYMENT

A. No separate measurement or direct payment will be made for the work under this Section and all costs for same shall be included in the lump sum price bid.

END OF SECTION

SECTION 31 22 00

GRADING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Work included: Cut, fill, excavate, backfill, compact and grade the site as necessary to bring the roads, drives, building sites, paved areas and open areas to the lines and grades shown on the drawings.

1. The work includes, but is not necessarily limited to:

a. Building site preparation.

b. Roadway, parking area, drive and walk subgrade preparation.

c. Excavations and formations of embankments.

d. Dressing of graded areas, shoulders and ditches.

2. Subsurface Classification: All excavation is unclassified and excavation of every description, regardless of material encountered within the grading limits of the project, shall be performed to the lines and grades indicated.

B. Removal and storage of topsoil.

C. Rough grading the site for improvements.

D. Topsoil and finish grading.

1.02 RELATED SECTIONS

A. Documents affecting work of this Section include, but are not necessarily limited to, General Conditions, and Sections in Division 1 of these specifications.

B. Section 31 11 00 - Clearing and Grubbing.

C. Section 31 25 00 - Erosion and Sedimentation Controls.

D. Section 31 23 16 - Excavation.

E. Section 31 23 16.13 – Trenching for Site Utilities.

F. Section 31 23 23.13 - Backfill and Compaction.

G. Section 32 11 23 - Aggregate Base Course.

H. Section 32 92 00 - Turf and Grasses.

1.03 Definitions

A. Open areas: Open areas shall be those areas that do not include building sites, paved areas, street right-of-way and parking areas.

B. Maximum density: Maximum weight in pounds per cubic foot of a specific material.

C. Optimum moisture: Percentage of water in a specific material at maximum density.

D. Rock excavation: Excavation of any hard natural substance which requires the use of explosives and/or special impact tools such as jack hammers, sledges, chisels or similar devices specifically designed for use in cutting or breaking rock, but exclusive of trench excavating machinery. To be considered as rock excavation, the material shall be continuous; individual boulders or rocks in soil will not be considered rock excavation.

E. Muck: Materials unsuitable for foundation because of organic content, saturation to the extent that it is somewhat fluid and must be removed by dragline, dredge or other special equipment, are designated as muck. No extra payment will be made for muck removal.

F. Unsuitable material: Unsuitable material is defined as earth material unsatisfactory for its intended use and as classified by the soils technician. In addition to organic matter, sod, muck, roots and rubbish, highly plastic clay soils of the CH and MH descriptions, and organic soils of the OL and OH descriptions, as defined in the Unified Soil Classification System shall be considered as unsuitable material.

G. Suitable material: Where the term suitable material is used in specification sections pertaining to earthwork, it means earth or materials designated as being suitable for their intended use by soils technicians or the Engineer. Suitable material shall be designated as meeting the requirements of the Unified Soil Classification System types SW, GW, GC, SC, SM, ML, CL or as designated in these specifications.

H. Select material: Select material is defined as granular material to be used where indicated on the drawings or where specified herein consisting of soils conforming to the Unified Soil Classification types SW, SM, GW or GM or as otherwise approved by the Engineer as select fill. Select material shall contain no stones or rubble larger than 1-1/2" in diameter.

I. Crushed stone (gravel): Crushed stone shall be No. 57 aggregate or equal conforming to ASTM C-33.

J. Excavation: Excavation is defined as unclassified excavation of every description regardless of materials encountered.

1.04 SUBMITTALS

A. Project Record Documents: Accurately record actual locations of utilities remaining by horizontal dimensions, elevations or inverts, and slope gradients.

1.05 QUALITY ASSURANCE

A. Perform Work in accordance with State of South Carolina, Department of Transportation standards.

B. Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this Section.

C. Comply with requirements of governmental agencies having jurisdiction.

D. A testing laboratory, approved by the Owner, will make such tests as are deemed advisable. Testing shall be as specified in Section 01 45 29, Testing Laboratory Services.

E. The Contractor shall schedule his work so as to permit a reasonable time for testing before placing succeeding lifts of fill material and shall keep the laboratory informed of his progress. The cost of the initial tests shall be paid for by the Contractor. Subsequent tests required as a result of improper compaction shall also be paid for by the Contractor.

F. Contractor shall provide all required equipment and contact Engineer to setup time for Proof Roll Testing across all areas that have been graded. The Engineer and Geotechnical Engineer will provide final approval to the Contractor during site visit. Any additional cost required from multiple testing visits and trip will be the responsibility of the Contractor, not the Owner nor Engineer.

1.06 PROJECT CONDITIONS

A. Protect above- and below-grade utilities that remain.

B. Protect bench marks, survey control points, existing structures, fences, sidewalks, paving, and curbs from grading equipment and vehicular traffic.

C. The Contractor must determine for himself the volume of material required by the site.

1.07 PRODUCT HANDLING

A. Comply with pertinent provisions of Section 01 60 00 - Product Requirements.

1.08 JOB CONDITIONS

A. Notification of intent to excavate:

1. South Carolina Underground Utility Damage Prevention Act (S.C. Code Ann, 58-35-10, 2012) requires persons to ascertain the location of underground public utility property prior to excavation or demolition in certain situations. The Act also requires such persons to give timely notice of intent to excavate or demolish prior to commencing such operations. Failure to comply could subject the violator to a civil penalty of up to one thousand dollars ($1,000) for each violation of the Act.

2. Notification of intent to excavate may be given by calling this toll free number: 1-800-922-0983.

PART 2 PRODUCTS

2.01 SOIL MATERIALS

A. General:

1. Soil material used as fill, backfill, subgrade for structures or pavements, embankments, or site grading shall consist of suitable material as found available on site until such supply of on-site material is depleted.

a. Provide suitable material free from organic matter and deleterious substances, containing no rocks or lumps over 6" in greatest dimension, and with not more than 15% of the rocks or lumps larger than 2-1/2" in their greatest dimension.

b. Do not permit rocks having a dimension greater than 1" in the upper 6" of fill or embankment.

2. Should the quantity of suitable on-site material be insufficient to complete the work, suitable borrow material as approved by the Engineer shall be provided by the Contractor at no additional expense to the Owner.

3. Select materials may be provided from on-site if acceptable material as approved by the Engineer is available on site. Otherwise approved select material shall be provided by the Contractor from an off-site source.

B. Topsoil:

1. Use topsoil consisting of material removed from the top 3" to 6" of existing on-site soils.

2. Use topsoil containing no stones, roots or large clods of soil.

3. Stockpile topsoil separate from other excavated material.

2.02 WEED KILLER

A. Provide a dry, free-flowing, dust free chemical compound, soluble in water, capable of inhibiting growth of vegetation and approved for use on this work by governmental agencies having jurisdiction.

2.03 EQUIPMENT

A. Use equipment adequate in size, capacity and numbers to accomplish the work in a timely manner without undue waste or damage of material.

PART 3 EXECUTION

3.01 EXAMINATION

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

B. Surface Conditions:

1. Examine the areas and conditions under which work of this Section will be performed. Correct conditions detrimental to timely and proper completion of the work. Do not proceed until unsatisfactory conditions are corrected.

3.02 PREPARATION

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

B. Stake and flag locations of known utilities.

C. Locate, identify, and protect utilities that remain, from damage.

D. Notify utility company to remove and relocate utilities.

E. Clearing and grubbing: Clear and grub areas to be graded prior to commencement of the

grading operations.

F. Where so directed by the Owner, protect and leave standing designated desirable trees.

G. Complete any demolition and/or removal work as may be required prior to grading operations.

H. Dispose of all clearing, grubbing and demolition debris and other deleterious material off the project site. Vegetation, roots, brush, rubbish, stumps, etc. may be burned on-site where permitted by local authorities and regulations and approved by the Engineer.

I. Topsoil: Strip topsoil to a depth of 3" to 6" without contamination from the subsoil and stockpile topsoil separate from other excavated materials.

1. Transport and deposit topsoil in storage piles convenient to areas that are to receive topsoil or in other locations as indicated or approved by the Engineer.

2. Deposit topsoil in areas that are already graded and will not be disturbed by on-going construction.

3. Dispose of unsuitable or unusable stripped material off-site or as otherwise directed by the Engineer.

J. Sampling and preliminary testing:

1. Prior to beginning the grading operations, the Contractor shall submit to the Engineer his proposed sequence of excavation operations.

2. Based upon the sequence of excavation, samples of the fill materials will be obtained as excavation proceeds and tested for grain size permeability and moisture density relationship using the Standard Proctor Method (ASTM D698, Method A).

3. Allow sufficient time for completion of laboratory tests before any fill operations begin, using the soils being tested.

3.03 ROUGH GRADING

A. Remove topsoil from areas to be further excavated, re-landscaped, or re-graded, without mixing with foreign materials.

B. Remove subsoil from areas to be further excavated, re-landscaped, or re-graded.

C. Do not remove wet subsoil, unless it is subsequently processed to obtain optimum moisture content.

D. When excavating through roots, perform work by hand and cut roots with sharp axe.

E. Perform excavating of every type of material encountered within the limits of the Work to the lines, grades and elevations indicated and specified herein.

F. Suitable excavated materials:

1. Use all suitable materials removed from the excavation as far as practicable in the formation of the embankments, subgrades, shoulders, building sites and other places as directed.

2. Unless otherwise indicated on the drawings or approved by the Engineer, surplus suitable material shall be removed from the site and disposed of by the Contractor.

G. Unsuitable excavated material: Remove from the site and dispose of all unsuitable material unless otherwise approved by the Engineer.

H. Rock excavation:

1. Notify the Engineer upon encountering rock or similar material which cannot be removed or excavated by conventional earth moving or ripping equipment.

2. Do not use explosives without written permission from the Engineer.

3. When explosives are permitted, use only experienced powdermen or persons who are licensed or otherwise authorized to use explosives. Store, handle and use explosives in strict accordance with all regulatory bodies and the "Manual of Accident Prevention in Construction" of the Associated General Contractors of America, Inc.

4. The Contractor shall be solely responsible for any damage resulting from the use of explosives.

5. The Contractor is responsible for securing all permit required in performing this work.

I. Unauthorized excavation:

1. Excavation of material to depths below the grades indicated unless so directed by the Engineer will be deemed unauthorized excavation.

2. Unauthorized overexcavation shall be backfilled and compacted without any additional expense to the Owner.

J. In the event that it is necessary to remove unsuitable material to a depth greater than that shown on the drawings or otherwise specified, the Contractor, upon receiving direction from the Engineer, shall remove, replace and compact such material as directed by the Engineer at no additional expense by the Owner.

K. Filling and Backfilling

1. Use fills formed of suitable material placed in layers of not more than 8" in depth measured loose and rolled and/or vibrated with suitable equipment until compacted.

2. Do not place rock that will not pass through a 6" diameter ring within the top 12" of the surface of the completed fill or rock that will not pass through a 3" diameter ring within the top 6" of the completed fill.

3. Do not use broken concrete or asphaltic pavement in fills.

4. Selection of borrow material:

a. Material in excess of that available on the site shall be suitable material furnished by the Contractor from private sources selected by the Contractor. The material shall be approved by the Engineer before use. All expenses involved in securing, developing, transporting and placing the material shall be borne by the Contractor.

L. Placing and compacting:

1. Place backfill and fill materials in layers not more than 8" in loose depth.

2. Before compacting, moisten or aerate each layer as necessary to provide the optimum moisture content.

3. Compact each layer to required percentage of maximum density for the area.

4. Do not place backfill or fill material on surfaces that are muddy, frozen, or contain frost or ice.

5. Place backfill and fill materials evenly adjacent to structures, to required elevations.

6. Take care to prevent wedging action of backfill against structures by carrying the material uniformly around the structures to approximately the same elevation in each lift.

M. Moisture control:

1. Do not use soil material that is either too dry or too wet to achieve proper compaction.

2. Where subgrade or layer of soil material is too dry to achieve proper compaction, uniformly apply water to surface of soil material such that free water does not appear on the surface during or subsequent to compacting operations.

3. Remove and replace, or scarify and air dry, soil material that is too wet to permit compacting to the specified density.

4. Soil material that has been removed because it is too wet to permit compacting may be stockpiled or spread and allowed to dry. Assist drying by disking, harrowing, or pulverizing until moisture content is reduced to a satisfactory value as determined by moisture-density relation tests approved by the Engineer.

N. Compaction requirements:

1. Compact soils to not less than the following percentages of maximum dry density as determined in accordance with ASTM D698, Method A (Standard Proctor).

2. Fill beneath structures and beneath an area extending 10' beyond the limits of the foundation:

   a. Top 12" of Subgrade 98%

   b. All other fill material 95%

3. Beneath Roadways:

   a. Top 12" of Subgrade 98%

   b. All other fill material 95%

4. Embankments:

a. Top 12" of Subgrade 98%

b. All other fill material 95%

O. Placing of Special Materials:

1. Placing impervious liner materials:

a. Place selected fine grain soils on bottom and side slopes of the basin to the indicated depth.

b. Inspect and proofroll the stripped and grubbed subgrade prior to placement of any liner material, as specified hereinafter.

c. Spread liner material in 8" maximum, loose lift thickness to provide a 6" compacted lift thickness.

d. Adjust soil moisture content to 1 to 3 percentage points "wet" of the optimum moisture contents.

e. Compact at 98% of maximum density.

f. Maintain liner material sufficiently moist to prevent drying and cracking, until such time as the basin is filled.

P. Stability: Replace damaged or displaced subsoil to same requirements as for specified fill.

3.04 SOIL REMOVAL

A. Stockpile excavated topsoil on site.

B. Stockpile subsoil to be re-used on site; remove remainder from site.

C. Stockpiles: Use areas designated on site; pile depth not to exceed 8 feet (2.5 m); protect from erosion.

3.05 FINISH GRADING

A. General:

1. Uniformly grade the areas within limits of grading under this Section, including adjacent transition areas.

2. Smooth the finished surfaces within specified tolerance.

3. Grade with uniform levels or slopes between points where elevations are shown on the drawings, or between such points and existing grades.

4. Where a change of slope is indicated on the drawings, construct a rolled transition section having a minimum radius of approximately 8'0", unless adjacent construction will not permit such a transition, or if such a transition defeats positive control of drainage.

B. Before Finish Grading:

1. Verify subgrade has been contoured and compacted.

C. Remove debris, roots, branches, stones, in excess of 1/2 inch (13 mm) in size. Remove soil contaminated with petroleum products.

D. Grading adjacent to structures: Grade areas adjacent to buildings to achieve drainage away from the structures and to prevent ponding.

E. Ditches and gutters and swales:

1. Cut accurately to the cross sections, grades and elevations shown.

2. Maintain excavations free from detrimental quantities of leaves, sticks, trash and other debris until completion of the work.

3. Dispose of excavated materials as specified herein; do not in any case deposit materials within 3'0" of the edge of a ditch.

F. Upon completion of site grading and other related site work, topsoil shall be uniformly spread over the graded or improved areas. Topsoil shall be evenly distributed to conform to final grade elevations shown on the plans.

G. Where topsoil is to be placed, scarify surface to depth of 3 inches (75 mm).

H. In areas where vehicles or equipment have compacted soil, scarify surface to depth of 3 inches (75 mm).

I. Place topsoil in areas where grassing/seeding are indicated.

J. Place topsoil to the following compacted thicknesses:

K. Areas to be seeded with grass not less than: 3 inches (75 mm).

L. Place topsoil during dry weather.

M. Remove roots, weeds, rocks, and foreign material while spreading topsoil.

N. Near plants spread topsoil manually to prevent damage.

O. Fine grade topsoil to eliminate uneven areas and low spots. Maintain profiles and contour of subgrade.

P. Lightly compact placed topsoil.

Q. Any surplus topsoil materials shall be disposed of in approved areas on the site.

3.06 TOLERANCES

A. Top Surface of Subgrade: Plus or minus 1/10 foot (30 mm) from required elevation.

B. Top Surface of Finish Grade: Plus or minus 1/2 inch (13 mm).

C. Construct areas outside of building or structure lines true to grades shown.

1. Where no grade is indicated, shape finish surface to drain away from buildings or structures, as approved by the Engineer.

D. Degree of finish shall be that ordinarily obtainable from bladegrader, supplemented with hand raking and finishing.

3.07 FIELD QUALITY CONTROL

A. See Section 31 23 23.13 - Backfill and Compaction, for compact density testing and the following:

B. Secure the Engineer's construction review and observation and approval of subgrades and fill layers before subsequent construction is permitted thereon.

C. Field density determinations will be made, at no additional cost to the Owner, to ensure that the specified densities are being obtained. Field density tests will be performed as determined by the Engineer, considering the following:

1. At areas to receive paving, at least one field density test for every 5,000 sq. ft. of subgrade area, but not less than three tests.

2. In each compacted fill layer, one field density test for every 5,000 sq. ft. of overlaying paved area, but not less than three tests.

3. In fill beneath structures, one field density test for every 2,500 sq. ft. in each layer.

4. Other tests as deemed necessary by the Engineer.

D. If, in the Engineer's opinion based on reports of the testing laboratory, subgrade or fills which have been placed are below specified density, provide additional compacting and testing until specified requirements are met.

1. Additional testing will be provided by the Owner-approved testing laboratory and all costs for the additional testing will be borne by the Contractor.

E. Proofrolling:

1. The Contractor shall proofroll subgrade of areas to receive paving, structures on fill or impervious lining material.

a. Make not less than 3 passes of a 25 to 50 ton rubber tired roller over the full area.

b. Unstable, soft or otherwise unsuitable materials revealed by the proofrolling shall be removed and replaced with satisfactory materials, compacted as specified herein.

3.08 CLEANING AND PROTECTION

A. Remove unused stockpiled topsoil and subsoil. Grade stockpile area to prevent standing water.

B. Leave site clean and raked, ready to receive landscaping.

C. Existing utilities:

1. Unless shown to be removed, locate and protect active utility lines shown on the drawings or otherwise made known to the Contractor prior to excavating. If damaged, repair or replace at no additional cost to the Owner.

2. If active utility lines are encountered and are not shown on the drawings or otherwise made known to the Contractor, promptly notify the Engineer and take necessary steps to assure that service is not interrupted.

3. If service is interrupted as a result of work under this Section, immediately restore service by repairing the damaged utility at no additional cost to the Owner.

4. If existing utilities are found to interfere with the permanent facilities being constructed under this Section, immediately notify the Engineer and secure his instructions.

5. Do not proceed with permanent relocation of utilities until written instructions are received from the Engineer.

D. Protection of persons and property:

1. Barricade open holes and depressions occurring as part of this Work, and post warning lights on property adjacent to or with public access.

2. Operate warning lights during hours from dusk to dawn each day and as otherwise required.

3. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, washout and other hazards created by operations under this Section.

E. Use means necessary to prevent dust becoming a nuisance to the public, to neighbors, and to other work being performed on or near the site.

F. Maintain access to adjacent areas at all times.

G. Excavate and backfill in a manner and sequence that will provide proper drainage at all times.

3.09 MAINTENANCE

A. Protection of newly graded areas:

1. Protect newly graded areas from traffic and erosion, and keep free from trash and weeds.

2. Repair and re-establish grades in settled, eroded and rutted areas to the specified tolerances.

B. Where completed compacted areas are disturbed by subsequent construction operations or adverse weather, scarify the surface, reshape, and compact to the required density prior to further construction.

3.10 MEASUREMENT AND PAYMENT

A. No separate measurement or direct payment will be made for the work under this Section and all costs for same shall be included in the lump sum bid price.

END OF SECTION

SECTION 31 23 16

EXCAVATION

PART 1 GENERAL

1.01 WORK REQUIRED BY THIS SECTION

A. Excavating for Utility Structures, StormwaterLines

1.02 RELATED SECTIONS

A. Documents affecting work of this Section include, but are not necessarily limited to, General Conditions, and Sections in Division 01 of these Specifications.

B. Section 01 70 00 - Execution and Closeout Requirements: General requirements for dewatering of excavations and water control.

C. Section 31 22 00 - Grading.

D. Section 31 23 23.13 - Backfill and Compaction.

E. Section 31 23 16.13 - Trenching.

F. Section 31 37 00 - Riprap.

G. Section 31 25 00 - Erosion and Sedimentation Control.

1.03 PROJECT CONDITIONS

A. Verify that survey benchmarks and intended elevations for the Work are as indicated.

B. Protect plants, lawns, rock outcroppings, and other features to remain.

C. Protect bench marks, survey control points, existing structures, fences, sidewalks, paving, and curbs from excavating equipment and vehicular traffic.

1.04 CLASSIFICATION:

A. Classification: All excavation is unclassified and excavation of every description, regardless of material encountered within the excavation limits of the structure, shall be performed to the lines and grades indicated.

1.05 DEFINITIONS:

A. Open areas: Open areas shall be those areas that do not include building sites, paved areas, street right-of-way and parking areas.

B. Maximum density: Maximum weight in pounds per cubic foot of a specific material.

C. Optimum moisture: Percentage of water in a specific material at maximum density.

D. Rock excavation: Excavation of any hard natural substance which requires the use of explosives and/or special impact tools such as jack hammers, sledges, chisels or similar devices specifically designed for use in cutting or breaking rock, but exclusive of trench excavating machinery. To be considered as rock excavation, the material shall be continuous; individual boulders or rocks in soil will not be considered rock excavation.

E. Muck: Materials unsuitable for foundation because of organic content, saturation to the extent that it is somewhat fluid and must be moved by dragline, dredge, or other special equipment, are designated as muck. No extra payment will be made for muck removal.

F. Unsuitable material: Unsuitable material is defined as earth material unsatisfactory for its intended use and as classified by the soils technicians. In addition to organic matter, sod, muck, roots, and rubbish, highly plastic clay soils of the CH and MH descriptions, and organic soils of the OL and OH descriptions, as defined in the Unified Soil Classification System shall be considered as unsuitable material.

G. Suitable material: Where the term suitable material is used in specification sections pertaining to earthwork, it means earth or materials designated as being suitable for their intended use by soils technicians or the Engineer. Suitable material shall be designated as meeting the requirements of the Unified Soil Classification System types SW, GW, GC, SC, SM, ML, Cl or as designated in these specifications.

H. Select material: Select material is defined as granular material to be used where indicated on the drawings or where specified herein consisting of soils conforming to the Unified Soil Classification types SW, SM, GW, or GM or as otherwise approved by the Engineer as select fill. Select material shall contain no stones or rubble larger than 1-1/2" in diameter.

I. Crushed stone (gravel): Crushed stone shall be No. 57 aggregate or equal conforming to ASTM C 33.

J. Excavation: Excavation is defined as unclassified excavation of every description regardless of materials encountered.

1.06 QUALITY ASSURANCE

A. Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this Section.

B. Comply with requirements of governmental agencies having jurisdiction

C. Testing: A testing laboratory, approved by the Owner, will make such tests as are deemed advisable. Testing shall be as specified in Section 01 45 29, Testing Laboratory Services.

1. Schedule fill and backfill operations so as to permit a reasonable time for inspection and testing before placing succeeding lifts and keep the laboratory and Engineer informed of progress.

2. Notify the Engineer and allow sufficient time for observation and/or testing of foundation subgrades prior to commencing any work on the exposed excavation.

1.07 JOB CONDITIONS

A. If conditions encountered during construction warrant additional removal of unsuitable material below foundation subgrades, then remove unsuitable material and replace it as specified at no additional expense to the Owner.

1.08 PRODUCT HANDLING

A. Comply with pertinent provisions of Section 01 60 00.

PART 2 PRODUCTS – NOT USED

PART 3 EXECUTION

3.01 PREPARATION

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

B. See Section 31 22 00 - Grading, for additional requirements.

C. Locate, identify, and protect utilities that remain and protect from damage.

D. Notify utility company to remove and relocate utilities.

3.02 EXCAVATING

A. Underpin adjacent structures that could be damaged by excavating work.

B. Excavate to accommodate new structures and construction operations.

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

D. Preparation for Piling Work: Excavate to working elevations. Coordinate special requirements for piling.

E. Slope banks of excavations deeper than 4 feet (1.2 meters) to angle of repose or less until shored.

F. Do not interfere with 45 degree bearing splay of foundations.

G. Cut utility trenches wide enough to allow inspection of installed utilities.

H. Hand trim excavations. Remove loose matter.

I. Remove lumped subsoil, boulders, and rock up to 1/3 cu yd (0.25 m^3) measured by volume.

J. Correct areas that are over-excavated and load-bearing surfaces that are disturbed; See Section 31 23 23.13.

K. Conform to elevations and dimensions shown within a tolerance of 0.10', and extending a sufficient distance from footings and foundations to permit placing and removing concrete formwork, installation of services, other construction required and for construction observation.

L. Where earth will stand, shallow footing excavations may be cut to the exact size of the footing.

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

N. Remove excavated material that is unsuitable for re-use from site.

O. Stockpile excavated material to be re-used in area designated on site in accordance with Section 31 22 00 - Grading.

P. Remove excess excavated material from site.

3.03 FOUNDATION SUBGRADES

A. Excavate foundations and footings to a level bottom in firm, solid, suitable material.

B. Take care not to disturb the bottom of the excavation unless further compaction of the subgrade is required.

C. Notify the Engineer in due time to permit observation of the completed excavation prior to performing work on the foundation subgrade.

D. Should unsuitable or soft material be encountered at subgrade elevation, remove such material and replace with compacted suitable material or crushed stone from firm earth up to the indicated elevation.

1. In wet excavations or where groundwater is normally present, replace unsuitable material with crushed stone or lean concrete.

2. In dry excavations above the normal groundwater level, replace unsuitable material with compacted suitable material.

3. Unsuitable material shall be removed and replaced at no expense to the Owner.

4. Where rock is encountered at foundation level:

a. Use drilling, picking, wedging or similar methods leaving the foundation rock in an entirely solid and unshattered condition.

b. Roughen approximately level surfaces to provide satisfactory bond with concrete.

c. Cut steps or benches in sloped surfaces to provide satisfactory bond.

3.04 DRAINAGE

A. Provide drainage and control grading in the vicinity of the work to prevent drainage into the excavation.

3.05 ROCK EXCAVATION

A. Notify the Engineer upon encountering rock or similar material that cannot be removed or excavated by conventional earth moving or ripping equipment.

B. Do not use explosives without written permission from the Engineer.

C. When explosives are permitted, use only experienced powdermen or persons who are licensed or otherwise authorized to use explosives. Store, handle and use explosives in strict accordance with all regulatory bodies and the "Manual of Accident Prevention in Construction" of the Associated General Contractors of America, Inc.

D. The Contractor shall be solely responsible for any damage resulting from the use of explosives.

E. The Contractor is responsible for securing all permits required in performing this work.

F. Do not use blasting adjacent to existing buildings or structures. Remove rock at such locations using jack hammers and bull points.

3.06 UNAUTHORIZED EXCAVATION

A. Excavation of material to depths below the grades indicated unless so directed by the Engineer will be deemed unauthorized excavation.

B. Backfill and compact unauthorized over excavation at no expense to the Owner.

1. In wet excavations or excavations below normal groundwater elevations: Use crushed stone or lean concrete as directed by the Engineer.

2. In dry excavations above normal groundwater elevations: Use compacted suitable material.

3.07 DEWATERING

A. Remove all surface and subsurface waters from excavations and maintain the excavation in a dry condition during construction operations.

B. Maintain the water level below the excavation subgrade during excavation and construction.

1. Material disturbed below the foundation subgrade due to improper dewatering shall be removed and replaced with crushed stone or lean concrete at no expense to the Owner.

2. Use sumps, pumps, drains, trenching or well point system as necessary to maintain a dry excavation.

3. Dewatering by trench pumping will not be permitted if migration of fine grained natural material (running sand) from bottom, side walls or bedding material will occur.

C. Dispose of water pumped from excavations in storm drains having capacity, canals, trenches or other approved locations.

1. Contractor is responsible for acquiring all permits required to discharge the water and shall protect waterways from turbidity during the operation.

2. Prevent flooding of streets, roadways, or private property.

3. Provide engines driving dewatering pumps with residential type mufflers.

3.08 FIELD QUALITY CONTROL

A. See Section 01 40 00 - Quality Requirements, for general requirements for field inspection and testing.

B. Provide for visual inspection of load-bearing excavated surfaces before placement of foundations.

3.09 PROTECTION

A. Prevent displacement of banks and keep loose soil from falling into excavation; maintain soil stability.

B. Protect bottom of excavations and soil adjacent to and beneath foundation from freezing.

C. Protect structures, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, washout and other hazards created by operations under this Section.

D. Unless shown to be removed, locate and protect active utility lines shown on the drawings or otherwise made known to the Contractor prior to excavating. If damaged, repair or replace at no additional cost to the Owner.

E. If active utility lines are encountered and are not shown on the drawings or otherwise made known to the Contractor, promptly notify the Engineer and take necessary steps to assure that service is not interrupted.

F. Barricade open holes and depressions occurring as part of this work, and post warning lights on property adjacent to or with public access. Operating warning lights during hours from dusk to dawn each day and as otherwise required.

G. Side slopes: Slope, bench and/or shore sides of excavations and trench walls to maintain stability of the wall or sides. Pile materials obtained from the excavation a minimum of four feet from the edge of the excavation.

H. Shoring and sheeting: Where necessary, shore and sheet excavations with members of sizes and arrangement sufficient to prevent injury to persons, damage to structures or injurious caving or erosion.

1. Furnish, put in place, and maintain such sheeting and bracing as may be required to support the sides of excavations, to prevent any movement which could in any way diminish the width of the excavation below that necessary for proper construction, and to protect adjacent structures from undermining or other damage. Any movement or bulging that may occur shall be corrected immediately by the Contractor. Care shall be taken to prevent voids outside of the sheeting, but if voids are formed, they shall be immediately filled and compacted.

2. Take all precautions to prevent distress of existing structures because of sheeting installation or removal. Where the removal of sheeting may cause damage to existing or newly constructed structures, such sheeting shall be left in place at no expense to the Owner.

3. All sheeting and shoring operations and maintenance thereof shall be the responsibility of the Contractor.

3.10 MEASURMENT AND PAYMENT

A. No separate measurement or direct payment will be made for the work under this Section and all costs for same shall be included in the lump sum bid.

END OF SECTION

SECTION 31 23 16.13

TRENCHING FOR SITE UTILITIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Backfilling and compacting for underground utilities.

1.02 RELATED REQUIREMENTS

A. Documents affecting work of this Section include, but are not necessarily limited to, General Conditions, Sections in Division 1 of these Specifications.

B. Section 01 71 23 - Field Engineering.

C. Section 31 22 00 - Grading.

D. Section 31 23 16 - Excavation.

E. Section 31 23 23.13 – Backfill and Compaction.

F. Section 33 41 00 - Storm Drainage Piping.

1.03 DEFINITIONS

A. Subgrade Elevations: Indicated on drawings.

1.04 REFERENCES

A. AASHTO T 180 - Standard Specification for Moisture-Density Relations of Soils Using a 4.54 kg (10-lb) Rammer and a 457 mm (18 in.) Drop; American Association of State Highway and Transportation Officials; 2010 (2009).

B. ASTM C136 - Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates; 2006.

C. ASTM D698 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft3 (600 kN-m/m3)); 2012.

D. ASTM D1556 - Standard Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method; 2007.

E. ASTM D1557 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft3 (2,700 kN m/m3)); 2012.

F. ASTM D2167 - Standard Test Method for Density and Unit Weight of Soil in Place by the Rubber Balloon Method; 2008.

G. ASTM D2487 - Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System); 2011.

H. ASTM D 2922 - Standard Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth); 2005.

I. ASTM D3017 - Standard Test Method for Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth); 2005.

J. ASTM D4318 - Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils; 2010.

K. ASTM D6938 - Standard Test Method for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth); 2010

1.05 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Samples: 10 lb sample of each type of fill; submit in air-tight containers to testing laboratory.

C. Materials Sources: Submit name of imported materials source.

D. Fill Composition Test Reports: Results of laboratory tests on proposed and actual materials used.

E. Compaction Density Test Reports.

1.06 DELIVERY, STORAGE AND HANDLING

A. When necessary, store materials on site in advance of need.

B. When fill materials need to be stored on site, locate stockpiles where indicated.

1. Separate differing materials with dividers or stockpile separately to prevent intermixing.

2. Prevent contamination.

3. Protect stockpiles from erosion and deterioration of materials.

C. Verify that survey bench marks and intended elevations for the Work are as indicated.

D. Protect plants, lawns, rock outcroppings and other features to remain.

E. Protect bench marks, survey control points, existing structures, fences, sidewalks, paving, and curbs from excavating equipment and vehicular traffic.

1.07 QUALITY ASSURANCE

A. Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this Section.

B. Use equipment adequate in size, capacity, and numbers to accomplish the work in a timely manner.

1.08 JOB CONDITIONS

A. Existing utilities:

1. Approximate location of certain underground lines and structures are shown on the plans for information only, other underground lines or structures are not shown.

2. Locate these and other possible unknown utility lines using electronic pipe finder, or other approved means.

3. Locate, excavate and expose all existing underground lines in advance of trenching operations.

4. The Contractor will be held responsible for the workmanlike repair of any damage done to any of these utilities in the execution of his work under this Section.

5. The Contractor shall familiarize himself with the existing conditions and be prepared to adequately care for and safeguard himself and the Owner from damage.

B. Notification of intent to excavate:

1. South Carolina Underground Utility Damage Prevention Act (S.C. Code Ann, 58-35-10, CT-SEQ, Supp. 1978) requires persons to ascertain the location of underground public utility property prior to excavation or demolition in certain situations. The Act also requires such persons to give timely notice of intent to excavate or demolish prior to commencing such operations. Failure to comply could subject the violator to a civil penalty of up to one thousand dollars ($1,000) for each violation of the Act.

a. Notification of intent to excavate may be given by calling this toll free number: 811.

C. Protecting trees, shrubbery and lawns:

1. Trees and shrubbery in developed areas and along the trench line shall not be disturbed unless absolutely necessary, and subject to the approval of the Engineer.

a. Any such trees and shrubbery necessary to be removed shall be heeled in and replanted.

2. Where trenches cross private property through established lawns, sod shall be cut, removed, stacked and maintained in suitable condition until replacement is approved by the Engineer.

a. Topsoil underlying lawn areas shall be removed and kept separate from general excavated materials.

D. Clearing:

1. Perform all clearing necessary for installation of the complete work.

2. Clearing shall consist of removing all trees, stumps, roots, brush and debris in the rights-of-way obtained for the Work.

3. All timber of merchantable size shall remain the property of the Owner and shall be trimmed and cut in such lengths as directed and stacked along the edge of the right-of-way.

4. All other material, including trimmings from above, shall be completely disposed of in a satisfactory manner.

E. Removing and resetting fences:

1. Where existing fences must be removed to permit construction of utilities:

a. Remove such fences and, as the Work progresses, reset the fences in their original location and condition.

b. Provide temporary fencing or other safeguards as required to prevent stock and cattle from wandering to other lands.

F. Restoration of disturbed areas:

1. Restore all areas disturbed by, during or as a result of construction activities to their existing or better condition.

2. Do not interpret this as requiring replacement of trees and undergrowth in undeveloped sections of the rights-of-way.

G. Minimizing silting and bank erosion during construction:

1. During construction, protective measures shall be taken and maintained to minimize silting and bank erosion of creeks and rivers adjacent to the work being performed during construction.

PART 2 PRODUCTS

2.01 FILL MATERIALS

A. General Fill: Subsoil excavated on-site.

1. Graded.

2. Free of lumps larger than three (3) inches, rocks larger than two (2) inches, and debris.

3. Conforming to ASTM D 2487 Group Symbol CL.

B. Granular Fill - Fill Type No. 57: Coarse aggregate, conforming to State of South Carolina Highway Department standard.

C. Granular Fill - Gravel: Pit run washed stone; free of shale, clay, friable material and debris.

1. Graded in accordance with ASTM D 2487 Group Symbol GW.

2. Graded in accordance with ASTM C 136, within the following limits:

a. 2 inch sieve: 100 percent passing.

b. 1 inch sieve: 95 percent passing.

c. 3/4 inch sieve: 95 to 100 percent passing.

d. 5/8 inch sieve: 75 to 100 percent passing.

e. 3/8 inch sieve: 55 to 85 percent passing.

f. No. 4 sieve: 35 to 60 percent passing.

g. No. 16 sieve: 15 to 35 percent passing.

h. No. 40: 10 to 25 percent passing.

i. No. 200: 5 to 10 percent passing.

D. Granular Fill - Pea Gravel: Natural stone; washed, free of clay, shale, organic matter.

1. Grade in accordance with ASTM D 2487 Group Symbol GM.

2. Graded in accordance with ASTM C 136, within the following limits:

a. Minimum Size: 1/4 inch.

b. Maximum Size: 5/8 inch.

E. Sand: Natural river or bank sand; washed; free of silt, clay, loam, friable or soluble materials, and organic matter.

1. Grade in accordance with ASTM D 2487 Group Symbol SW.

2. Graded in accordance with ASTM C 136; within the following limits:

a. No. 4 sieve: 100 percent passing.

b. No. 14 sieve: 10 to 100 percent passing.

c. No. 50 sieve: 5 to 90 percent passing.

d. No. 100 sieve: 4 to 30 percent passing.

e. No. 200 sieve: 0 percent passing.

F. Topsoil: Topsoil excavated on-site.

1. Select.

2. Graded.

3. Free of roots, rocks larger than 1/2 inch, subsoil, debris, large weeds and foreign matter.

4. Acidity range (pH) of 5.5 to 7.5.

5. Containing a minimum of 4 percent and a maximum of 25 percent inorganic matter.

6. Conforming to ASTM D2487 Group Symbol OH.

2.02 EXCAVATED MATERIALS

A. Perform all excavation of every description and of whatever substances encountered to depths indicated or specified.

B. Pile material suitable for backfilling in an orderly manner at safe distance from banks or trenches to avoid overloading and to prevent slides or cave-ins.

C. Remove and deposit unsuitable or excess materials as directed by the Engineer.

2.03 BACKFILL MATERIALS

A. Provide from materials excavated for installation of utility.

1. Select soil material free from organic matter and deleterious substances, containing no rocks or lumps over 2-inches in greatest dimension for backfill up to 12-inches above top of utility being covered.

2. Do not permit rocks larger than 2-inches in greatest dimension in top 6-inches of backfill.

2.04 OTHER MATERIALS

A. Provide other materials, not specifically described but required for a complete and proper installation, as selected by the Contractor subject to the approval of the Engineer.

B. Should the quantity of suitable on-site material be insufficient to complete the work, provide suitable borrow material as approved by the Engineer at no additional expense to the Owner.

C. Provide select materials from on-site if acceptable material as approved by the Engineer is available on-site. Otherwise, provide approved select material from an off-site source.

2.05 SOURCE QUALITY CONTROL

A. Where fill materials are specified by reference to a specific standard, test and analyze samples for compliance before delivery to site.

B. If tests indicate materials do not meet specified requirements, change material and retest.

C. Provide materials of each type from same source throughout the Work.

PART 3 EXECUTION

3.01 EXAMINATION

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

3.02 PREPARATION

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

B. See Section 31 22 00 for additional requirements.

C. Locate, identify, and protect utilities that remain and protect from damage.

D. Notify utility company to remove and relocate utilities.

E. Protect benchmarks, survey control points, existing structures, fences, sidewalks, paving, and curbs from excavating equipment and vehicular traffic.

F. Protect plants, lawns, rock outcroppings, and other features to remain.

3.03 PROTECTION OF EXISTING UTILITIES AND ADJACENT STRUCTURES

A. Existing utilities:

1. Unless shown to be removed, protect active utility lines shown on the drawings or otherwise made known to the Contractor prior to trenching. If damaged, repair or replace at no additional cost to the Owner.

2. If active utility lines are encountered and are not shown on the Drawings or otherwise made known to the Contractor, promptly take necessary steps to assure that service is not interrupted.

3. If service is interrupted as a result of work under this Section, immediately restore service by repairing the damaged utility at no additional cost to the Owner.

4. If existing utilities are found to interfere with the permanent facilities being constructed under this Section, immediately notify the Engineer and secure his instructions.

5. Do not proceed with permanent relocation of utilities until written instructions are received from the Engineer.

6. Locations within streets or highways:

   a. Comply with the South Carolina Department of Transportation's (SCDOT) "Encroachment Permit" issued for the Work and SCDOT's "A Policy for Accommodating Utilities on Highway Rights-of-Way".

   b. Take all precautions and comply with all requirements as may be necessary to protect the improvements, including barricades for protection of traffic.

   c. Keep minimum of one lane open to traffic at all times where utility crosses street or highway.

7. Protection of persons and property:

   a. Barricade open holes and depressions occurring as part of the Work, and post warning lights on property adjacent to or with public access.

   b. Operate warning lights during hours from dusk to dawn each day and as otherwise required.

   c. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, washout and other hazards created by operations under this Section.

8. Dewatering:

   a. Remove all water, including rain water, encountered during trench and sub-structure work to an approved location by pumps, drains, and other approved methods.

   b. Keep trenches and site construction area free from water.

9. Use means necessary to prevent dust becoming a nuisance to the public, to neighbors, and to other work being performed on or near the site.

10. Maintain access to adjacent areas at all times.

3.04 TRENCHING

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

B. Slope banks of excavations deeper than 4 feet to angle of repose or less until shored.

C. Do not interfere with 45 degree bearing splay of foundations.

D. Cut trenches wide enough to allow inspection of installed utilities.

E. Hand trim excavations. Remove loose matter.

F. Remove large stones and other hard matter that could damage piping or impede consistent backfilling or compaction.

G. Remove lumped subsoil, boulders, and rock up to 1/3 cu yd measured by volume.

H. Remove excavated material that is unsuitable for re-use from site.

I. Stockpile excavated material to be re-used in area designated on site in accordance with Section 31 22 00.

J. Remove excess excavated material from site.

K. Trench Excavation:

   1. Remove all materials of whatever substance encountered.

L. Where trenching occurs in existing lawns, remove turf in sections and keep damp. Replace turf upon completion of the backfilling.

M. Open cut:

   1. Excavate for utilities by open cut.

   2. If conditions at the site prevent such open cut, and if approved by the Engineer, tunneling may be used.

   3. Short sections of a trench may be tunneled if, in the opinion of the Engineer, the conductor can be installed safely and backfill can be compacted properly into such tunnel.

4. Remove boulders and other interfering objects, and backfill voids left by such removals, at no additional cost to the Owner.

5. Remove wet or otherwise unstable soil incapable of properly supporting the utility, as determined by the Engineer, to depth required and backfill to proper grade with stone bedding material, at no additional cost to the Owner.

6. Excavating for appurtenances:

   a. Excavate for manholes and similar structures to a distance sufficient to leave at least 12-inches clear between outer surfaces and the embankment or shoring that may be used to hold and protect the banks.

   b. Overdepth excavation beyond such appurtenances that has not been directed will be considered unauthorized. Fill with sand, gravel, or lean concrete as directed by the Engineer, and at no additional cost to the Owner.

N. Trench to the minimum width necessary for proper installation of the utility, with sides as nearly vertical as possible. Accurately grade the bottom to provide uniform bearing for the utility.

1. Dig to a true grade and to provide a smooth continuous support along the entire length of the pipe line.

2. Excavate to a width not less than 12" greater than the outside diameter of the pipe.

3. Trench depth shall provide a minimum of 4' of cover over the pipe as measured along the pipe centerline.

4. Where the pipeline crosses creeks, drainage ditches or land subject to flooding, the depth of cover shall be 4' minimum.

5. Where the pipeline crosses existing gas mains or other utilities, a minimum of 24" of separation under the existing utility shall be maintained. Additional depth of excavation as required to maintain separation shall be completed at no additional cost to the Owner.

6. At any creek, draw, gully, embankment or other place where rough terrain exists, the trench shall be graded to avoid the use of bends or deflections greater than 2-1/2º per joint unless otherwise approved by the Engineer.

   a. Where changes in direction occur requiring greater than 2-1/2º deflection, field bending of the pipe is to be used with minimum bending radius being no less than 10 times the pipe diameter.

O. Provide sheeting and shoring necessary for protection of the Work and for the safety of personnel.

1. Remove in units when level of backfilling has reached the elevation necessary to protect the utility work and adjacent property.

2. Sheeting at the bottom of trenches over 10-feet deep for sewers 15-inches and larger in size, shall remain in place and be cut off no less than 2-inches above top of pipe, at no additional cost to the Owner.

3. When, in the opinion of the Engineer, other sheeting cannot be safely removed, it shall be left in place and the Contractor will be paid for such sheeting at the prices bid.

   a. Cut such sheeting off at least 2-feet below finished surface.

   b. No lumber for sheeting or shoring exceeding that size customarily used will be paid for unless the use of larger sizes has been ordered, in writing, by the Engineer.

P. Depressions:

1. Dig bell holes and depressions for joints after the trench has been graded. Provide uniform bearing for the pipe on prepared bottom of the trench.

2. Except where rock is encountered, do not excavate below the depth indicated or specified.

3. Where rock is encountered, excavate rock to a minimum overdepth of 4-inches below the trench depth indicated or specified, and to provide 6-inches clearance in any horizontal direction from all parts of the utility and appurtenances.

Q. Comply with pertinent OSHA regulations in regards to the excavation of utilities.

3.05 PREPARATION FOR UTILITY PLACEMENT

A. Cut out soft areas of subgrade not capable of compaction in place. Backfill with general fill.

B. Compact subgrade to density equal to or greater than requirements for subsequent fill material.

C. Until ready to backfill, maintain excavations and prevent loose soil from falling into excavation.

3.06 BACKFILLING

A. Backfill to contours and elevations indicated using unfrozen materials.

B. Backfill trenches and excavations immediately after the pipes are laid, unless other protection is directed or indicated.

C. Select and deposit backfill materials with special reference to the future safety of the pipes.

D. Reopen trenches which have been improperly backfilled, to a depth as required for proper compaction. Refill and compact as specified, or otherwise correct to the approval of the Engineer.

E. Surplus material shall be disposed of as directed by the Engineer.

F. Original surface shall be restored to the approval of the Engineer.

G. Fill up to subgrade elevations unless otherwise indicated.

H. Lower portion of trench:

1. Deposit approved backfill and bedding material in layers of 6-inches maximum thickness, and compact with suitable tampers to the density of the adjacent soil until there is a cover of not less than 36-inches over sewers and 12-inches over other utility lines.

2. Take special care in backfilling and bedding operations not to damage pipe and pipe coatings.

I. Remainder of trench:

1. Except for special materials for pavements, backfill the remainder of the trench with material free from stones larger than 6-inches or 1/2 the layered thickness, whichever is smaller, in any dimension.

2. Deposit backfill material in layers not exceeding the thickness specified, and compact each layer to the minimum density directed by the soil engineer.

J. Undeveloped areas:

1. Backfill in wooded, swampy or undeveloped areas shall be as specified hereinbefore, except that tamping of the backfill above a level 2-feet over the top of the pipe will not be required.

2. Mound excavated material neatly over the ditch to provide for future settlements.

K. Employ a placement method that does not disturb or damage other work.

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

M. Maintain optimum moisture content of fill materials to attain required compaction density.

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

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

P. Slope grade away from building minimum 2 inches in 10 ft, unless noted otherwise. Make gradual grade changes. Blend slope into level areas.

Q. Correct areas that are over-excavated.

1. Thrust bearing surfaces: Fill with concrete.

2. Other areas: Use general fill, flush to required elevation, compacted to minimum 95 percent of maximum dry density.

R. Compaction Density Unless Otherwise Specified or Indicated:

1. Under paving, slabs-on-grade, and similar construction: 100 percent of maximum dry density.

2. At other locations: 95 percent of maximum dry density.

S. Reshape and re-compact fills subjected to vehicular traffic.

3.07 BEDDING AND FILL AT SPECIFIC LOCATIONS

A. Use general fill unless otherwise specified or indicated.

B. Utility Piping:

1. Bedding: Use general fill.

2. Cover with general fill.

3. Fill up to subgrade elevation.

4. Compact in maximum 8 inch lifts to 95 percent of maximum dry density.

C. At Pipe Culverts:

1. Bedding: Use general fill.

2. Cover with general fill.

3. Fill up to subgrade elevation.

4. Compact in maximum 8 inch lifts to 95-percent of maximum dry density.

3.08 TOLERANCES

A. Top Surface of General Backfilling: Plus or minus 1 inch from required elevations.

3.09 FIELD QUALITY CONTROL

A. See Section 01 40 00 - Quality Requirements, for general requirements for field inspection and testing.

B. Perform compaction density testing on compacted fill in accordance with ASTM D1556, ASTM D2167, ASTM D3017, or ASTM D6938.

C. Perform compaction density testing on compacted fill in accordance with ASTM D1556, ASTM D2167, ASTM D2922, or ASTM D3017.

D. Evaluate results in relation to compaction curve determined by testing uncompacted material in accordance with ASTM D698 ("standard Proctor"), ASTM D1557 ("modified Proctor"), or AASHTO T 180.

E. If tests indicate work does not meet specified requirements, remove work, replace and retest.

F. Frequency of Tests:

1. At least one (1) field density test for every fifty (50) linear feet of trench within each lift.

3.10 CLEANING

A. Leave unused materials in a neat, compact stockpile.

B. Remove unused stockpiled materials, leave area in a clean and neat condition. Grade stockpile area to prevent standing surface water.

C. Leave borrow areas in a clean and neat condition. Grade to prevent standing surface water.

END OF SECTION

SECTION 31 23 23.13

BACKFILL AND COMPACTION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Filling, backfilling, and compacting for structure volume below grade.

B. Backfilling and compacting for utilities outside the structure to utility main connections.

C. Filling holes, pits, and excavations generated as a result of removal (demolition) operations.

1.02 RELATED SECTIONS

A. Documents affecting work of this Section include, but are not necessarily limited to, General Conditions, Sections in Division 01 of these Specifications.

B. Geotechnical Data – Geotechnical Exploration Reports

C. Section 31 22 00 – Grading.

D. Section 31 23 16.13 - Excavation.

E. Section 31 23 16.13 – Trenching

F. Section 31 25 00 - Erosion and Sedimentation Control.

G. Section 03 30 00 - Cast-in-Place Concrete.

1.03 REFERENCES

A. AASHTO T 180 - Standard Specification for Moisture-Density Relations of Soils Using a 4.54 kg (10-lb) Rammer and a 457 mm (18 in.) Drop; American Association of State Highway and Transportation Officials; 2001 (2004).

B. ASTM C 136 - Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates; 2006.

C. ASTM D 698 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft3 (600 kN-m/m3)); 2000a.

D. ASTM D 1556 - Standard Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method; 2000.

E. ASTM D 1557 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft3 (2,700 kN m/m3)); 2002

F. ASTM D 2167 - Standard Test Method for Density and Unit Weight of Soil in Place by the Rubber Balloon Method; 1994(R 2001).

G. ASTM D 2487 - Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System); 2006.

H. ASTM D 2922 - Standard Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth); 2005.

I. ASTM D 3017 - Standard Test Method for Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth); 2005.

J. ASTM D 4318 - Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils; 2005.

1.04 DEFINITIONS

A. Finish Grade Elevations: Indicated on drawings.

B. Subgrade Elevations: Indicated on drawings.

C. Open areas: Open areas shall be those areas that do not include building sites, paved areas, street right-of-way and parking areas.

D. Maximum density: Maximum weight in pounds per cubic foot of a specific material.

E. Optimum moisture: Percentage of water in a specific material at maximum density.

F. Muck: Materials unsuitable for foundation because of organic content, saturation to the extent that it is somewhat fluid and must be moved by dragline, dredge, or other special equipment, are designated as muck. No extra payment will be made for muck removal.

G. Unsuitable material: Unsuitable material is defined as earth material unsatisfactory for its intended use and as classified by the soils technicians. In addition to organic matter, sod, muck, roots, and rubbish, highly plastic clay soils of the CH and MH descriptions, and organic soils of the OL and OH descriptions, as defined in the Unified Soil Classification System shall be considered as unsuitable material.

H. Suitable material: Where the term suitable material is used in specification sections pertaining to earthwork, it means earth or materials designated as being suitable for their intended use by soils technicians or the Engineer. Suitable material shall be designated as meeting the requirements of the Unified Soil Classification System types SW, GW, GC, SC, SM, ML, Cl or as designated in these specifications.

I. Select material: Select material is defined as granular material to be used where indicated on the drawings or where specified herein consisting of soils conforming to the Unified Soil Classification types SW, SM, GW, or GM or as otherwise approved by the Engineer as select fill. Select material shall contain no stones or rubble larger than 1-1/2" in diameter.

J. Crushed stone (gravel): Crushed stone shall be No. 57 aggregate or equal conforming to ASTM C 33.

1.05 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Samples: 10 lb (4.5 kg) sample of each type of fill; submit in air-tight containers to testing laboratory.

C. Materials Sources: Submit name of imported materials source.

D. Fill Composition Test Reports: Results of laboratory tests on proposed and actual materials used.

E. Compaction Density Test Reports.

1.06 PROJECT CONDITIONS

A. Provide sufficient quantities of fill to meet project schedule and requirements. When necessary, store materials on site in advance of need.

B. When fill materials need to be stored on site, locate stockpiles where indicated.

1. Separate differing materials with dividers or stockpile separately to prevent intermixing.

2. Prevent contamination.

3. Protect stockpiles from erosion and deterioration of materials.

C. Verify that survey bench marks and intended elevations for the Work are as indicated.

1.07 QUALITY ASSURANCE

A. Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this Section.

B. Comply with requirements of governmental agencies having jurisdiction.

C. Testing: A testing laboratory, approved by the Owner, will make such tests as are deemed advisable. Testing shall be as specified in Section 01 45 29, Testing Laboratory Services.

1. Schedule fill and backfill operations so as to permit a reasonable time for inspection and testing before placing succeeding lifts and keep the laboratory and Engineer informed of progress.

2. Notify the Engineer and allow sufficient time for observation and/or testing of foundation subgrades prior to commencing any work on the exposed excavation.

1.08 JOB CONDITIONS

A. Comply with pertinent provisions of Section 01 60 00 – Product Requirements.

PART 2 PRODUCTS

2.01 SOIL MATERIAL GENERAL

A. Soil material used as fill, backfill or subgrade for structures shall consist of suitable material.

1. Provide suitable material free from organic matter and deleterious substances, containing no rocks or lumps over 6" in greatest dimension, and with not more than 15% of the rocks or lumps larger than 2-1/2" in their greatest dimension.

2. Do not permit rocks having a dimension greater than 1" in the upper 6" of fill or subgrade.

B. Where select material is indicated on the drawings or specified, use select granular material as defined herein and approved by the Engineer.

C. Where indicated on the drawings or specified, use gravel or crushed stone as defined herein.

D. Where indicated on the drawings or otherwise where desired, provide a lean concrete "mud slab" beneath foundations.

E.

1. Use 2000 psi concrete and a minimum thickness of 2-1/2".

2. With prior approval of the Engineer, a "mud slab" may be substituted for gravel base material except where the gravel base is required for drainage or for use with pressure relief valves.

2.02 FILL MATERIALS

A. General Fill: Subsoil excavated on-site.

1. Graded.

2. Free of lumps larger than 3 inches (75 mm), rocks larger than 2 inches (50 mm), and debris.

3. Conforming to ASTM D 2487 Group Symbol CL.

B. Granular Fill- Fill Type #57: Coarse aggregate, conforming to State of South Carolina Highway Department standard.

2.03 SOURCE QUALITY CONTROL

A. See Section 01 40 00 - Quality Requirements, for general requirements for testing and analysis of soil material.

B. If tests indicate materials do not meet specified requirements, change material and retest.

C. Provide materials of each type from same source throughout the Work.

PART 3 EXECUTION

3.01 EXAMINATION

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

3.02 PREPARATION

A. Scarify subgrade surface to a depth of 6 inches (150 mm) to identify soft spots.

B. Cut out soft areas of subgrade not capable of compaction in place. Backfill with general fill.

C. Compact subgrade to density equal to or greater than requirements for subsequent fill material.

D. Until ready to fill, maintain excavations and prevent loose soil from falling into excavation.

3.03 FILLING AND BACKFILLING

A. Fill to contours and elevations indicated using unfrozen materials.

B. Employ a placement method that does not disturb or damage other work.

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

D. Maintain optimum moisture content of fill materials to attain required compaction density.

E. Slope grade away from building minimum 2 inches in 10 ft (50 mm in 3 m), unless noted otherwise. Make gradual grade changes. Blend slope into level areas.

F. Correct areas that are over-excavated.

1. Other areas: Use general fill, flush to required elevation, compacted to minimum 97 percent of maximum dry density.

G. Compaction Density Unless Otherwise Specified or Indicated.

H. Reshape and re-compact fills subjected to vehicular traffic.

I. Use suitable material for all filling and backfilling operations.

J. Fill under structures: Deposit suitable material in layers not exceeding 8" in depth and compact each layer using proper equipment.

K.

1. Do not place rock that will not pass through a 6" diameter ring within the top 12" of the surface of the completed fill or rock that will not pass through a 3" diameter ring within the top 6" of the completed fill.

2. Do not place broken concrete, bricks, or asphaltic pavement in fills.

3. Where indicated on the drawings, provide select granular material.

L. Backfill excavations as promptly as progress of the Work permits, but not until completion of the following:

1. Inspection and acceptance of construction below finish grade including, where applicable, damp proofing and waterproofing.

2. Inspecting, testing, approving and recording locations of underground utilities.

3 Removing concrete formwork.

4 Removing shoring and bracing, and backfilling of voids with satisfactory materials.

5 Removing trash and debris.

6. Foundation walls have been in place seven days.

M. Placing and compacting:

1. Place backfill and fill materials in layers not more than 8" in loose depth.

2. Before compacting, moisten or aerate each layer as necessary to provide the optimum moisture content within ±2%.

3. Compact each layer to required percentage of maximum density for area.

4. Do not place backfill or fill material on surfaces that are muddy, frozen, or containing frost or ice.

5. Place backfill and fill materials evenly adjacent to structures, to required elevations.

6. Take care to prevent wedging action of backfill against structures by carrying the material uniformly around the structure to approximately the same elevation in each lift.

7. Do not operate heavy equipment closer to foundation or retaining walls than a distance equal to height of backfill above the footing.

   a. Compact remaining area using power driven hand tampers.

8. Where the construction includes basement or other underground walls having structural floors over them, do not backfill such walls until the structural floors are in place and have attained sufficient strength to support the walls.

3.04 FILL AT SPECIFIC LOCATIONS

A. Over Buried Utility Piping, Conduits, and Duct Bank in Trenches:

1. Bedding: Use general fill.

2. Cover with general fill.

3. Fill up to subgrade elevation.

4. Compact in maximum 8 inch (200 mm) lifts to 95 percent of maximum dry density.

B. At Lawn Areas:

1. Use general fill.

2. Fill up to 6 inches (150 mm) below finish grade elevations.

3. Fill up to subgrade elevations.

4. Compact to 95 percent of maximum dry density.

5. See Section 31 22 00 for topsoil placement.

3.05 COMPACTION REQUIREMENTS

A. Compact soils to not less than the following percentages of maximum dry density as determined in accordance with ASTM D698, Method A (Standard Proctor).

B. Existing in place subgrade below structures where subgrade has been disturbed by water, improper dewatering, or construction traffic.

1. Top 12" of subgrade: 98%

2. Below top 12" of subgrade: 95%

C. Fill beneath structures and beneath an area extending 10 feet beyond the limits of the foundation:

1. Top 12" of subgrade: 98%

2. Below top 12" of subgrade: 95%

D. Compaction of suitable material used to replace unsuitable material below foundation subgrades:

1. Top 12" of subgrade: 98%

2. Below top 12" of subgrade: 95%

3.06 BACKFILLING, FILLING AND COMPACTION

A. Use suitable material for all filling and backfilling operations.

B. Fill under structures: Deposit suitable material in layers not exceeding 8" in depth and compact each layer using proper equipment.

1. Do not place rock that will not pass through a 6" diameter ring within the top 12" of the surface of the completed fill or rock that will not pass through a 3" diameter ring within the top 6" of the completed fill.

2. Do not place broken concrete, bricks, or asphaltic pavement in fills.

3. Where indicated on the drawings, provide select granular material.

C. Backfill excavations as promptly as progress of the Work permits, but not until completion of the following:

1. Inspection and acceptance of construction below finish grade including, where applicable, damp proofing and waterproofing.

2. Inspecting, testing, approving and recording locations of underground utilities.

3. Removing concrete formwork.

4. Removing shoring and bracing, and backfilling of voids with satisfactory materials.

5. Removing trash and debris.

6. Foundation walls have been in place seven days.

D. Placing and compacting:

1. Place backfill and fill materials in layers not more than 8" in loose depth.

2. Before compacting, moisten or aerate each layer as necessary to provide the optimum moisture content within ±2%.

3. Compact each layer to required percentage of maximum density for area.

4. Do not place backfill or fill material on surfaces that are muddy, frozen, or containing frost or ice.

5. Place backfill and fill materials evenly adjacent to structures, to required elevations.

6. Take care to prevent wedging action of backfill against structures by carrying the material uniformly around the structure to approximately the same elevation in each lift.

7. Do not operate heavy equipment closer to foundation or retaining walls than a distance equal to height of backfill above the footing.

   a. Compact remaining area using power driven hand tampers.

8. Where the construction includes basement or other underground walls having structural floors over them, do not backfill such walls until the structural floors are in place and have attained sufficient strength to support the walls.

3.07 TOLERANCES

A. Top Surface of General Backfilling: Plus or minus 1 inch (25 mm) from required elevations

3.08 FIELD QUALITY CONTROL

A. See Section 01 40 00 - Quality Requirements, for general requirements for field inspection and testing.

B. Secure the Engineer's construction observation and approval of subgrades and fill layers before subsequent construction is permitted thereon.

C. Perform compaction density testing on compacted fill in accordance with ASTM D1556, ASTM D2167, ASTM D2922, or ASTM D3017.

D. Evaluate results in relation to compaction curve determined by testing uncompacted material in accordance with ASTM D 698 ("standard Proctor"), ASTM D 1557 ("modified Proctor"), or AASHTO T 180.

E. If tests indicate work does not meet specified requirements, remove work, replace and retest.

F. Frequency of Tests:

1. At areas to receive paving, at least one field density test for every 5,000 sq.ft. of subgrade area, but not less than three (3) tests.

2. In each compacted fill layer, one field density test for every 5,000 sq.ft. of overlaying paved area, but not less than three (3) tests.

3. In fill beneath structures, one field density test for every 2,500 sq.ft. in each layer.

4. Other tests as deemed necessary by the Engineer

G. If, the Engineer's opinion based on reports of the testing laboratory, subgrade or fills that have been placed are below specified density, provide additional compacting and testing until specified requirements are met.

1. Additional testing will be provided by the Owner's selected testing laboratory and all costs for the additional testing will be borne by the Contractor.

H. Proofrolling:

1. Upon request by the Engineer, proofroll the subgrade of structure foundations.

a. Make not less than three (3) passes of a 25 to 50 ton rubber tired roller over the full area.

b. Unstable, soft or otherwise unsuitable materials revealed by the proofrolling shall be removed and replaced with satisfactory material and compacted as specified herein.

3.09 DEWATERING

A. Remove all surface and subsurface waters from excavations and maintain the excavation in a dry condition during construction operations.

B. Maintain the water level below the excavation subgrade during excavation and construction.

1. Material disturbed below the foundation subgrade due to improper dewatering shall be removed and replaced with crushed stone or lean concrete at no expense to the Owner.

2. Use sumps, pumps, drains, trenching or well point system as necessary to maintain a dry excavation.

3. Dewatering by trench pumping will not be permitted if migration of fine grained natural material (running sand) from bottom, side walls or bedding material will occur.

C. Dispose of water pumped from excavations in storm drains having capacity, canals, trenches or other approved locations.

1. Contractor is responsible for acquiring all permits required to discharge the water and shall protect waterways from turbidity during the operation.

2. Prevent flooding of streets, roadways, or private property.

3. Provide engines driving dewatering pumps with residential type mufflers.

3.10 CLEAN-UP

A. Leave unused materials in a neat, compact stockpile.

B. Leave borrow areas in a clean and neat condition. Grade to prevent standing surface water.

1. Unstable, soft or otherwise unsuitable materials revealed by the proofrolling shall be removed and replaced with satisfactory material and compacted as specified herein.

C. Remove unused stockpiled materials, leave area in a clean and neat condition. Grade stock

3.11 MEASUREMENT AND PAYMENT

A. No separate measurement or direct payment will be made for the work under this section and all costs for same shall be included in the lump sum bid.

END OF SECTION

SECTION 31 25 00

EROSION AND SEDIMENTATION CONTROLS

PART 1 GENERAL

1.01 DESCRIPTION

A. Work included: Implement, Protect, Comply, and Enforce the Department of Health and Environmental Control approved construction stormwater pollution prevention plan (C-SWPPP) during the construction of this project to reduce soil erosion and siltation to the lowest reasonably achievable level.

1.02 GENERAL

A. Exercise every reasonable precaution, throughout the life of the project, to prevent the eroding of soil and the silting of rivers, streams, lakes, reservoirs, other water impoundments, ground or roadway surfaces, or other property. Erosion control practices to be used for this project are shown on the drawings and are to conform to South Carolina Department of Health and Environmental Control regulations.

PART 2 PRODUCTS

2.01 CRUSHED STONE

A. Provide #57 crushed stone for project entrance and exit.

B. Provide #57 crushed stone for temporary sediment barriers around inlets and for temporary stone check dams.

2.02 GRASSING

A. Comply with Section 32 92 00 – Turf and Grasses.

2.03 SILT FENCE

A. Posts:

1. Posts shall be self-fastener angle steel, 5' in length.

B. Woven wire shall conform to the requirements of ASTM A 116, Class I zinc coating for wire. Each woven square shall measure 5.33" X 12". The top and bottom wires shall be 10 gauge. All other wires shall be 12-1/2 gauge.

C. Filter fabric shall be synthetic fabric as manufactured by Celanese Fibers Co., DuPont, Industrial Netting or approved equal.

2.04 EROSION CONTROL BLANKET

A. Use erosion control blanket S150 and S250 of North American Green, or approved equal.

2.05 FILTER FABRIC (Temporary Stone Check Dam)

A. Use Stabilenka Filter Fabric (T-140N), Mirafil (140N) or approved equal.

PART 3 EXECUTION

3.01 GENERAL

A. Construct and maintain all erosion control measures until the substantial completion of the project.

3.02 TEMPORARY CONSTRUCTION ENTRANCE/EXIT

A. Construct a gravel area or pad at points where vehicles enter and leave a construction site.

B. Clear the entrance and exit area of all vegetation, roots, and other objectionable material and properly grade and place gravel to the grade and dimensions shown on the plans.

C. Construct drainage channels to carry water to a sediment trap or other suitable outlet.

D. Use geotextile fabrics to improve stability of the foundation in locations subject to seepage or high water table.

E. Maintain the gravel pad in a condition to prevent mud or sediment from leaving the construction site by periodic top dressing with two inches of stone.

F. After each rainfall, inspect any structure used to trap sediment and clean it out as necessary.

G. Immediately remove objectionable materials spilled, washed, or tracked onto public roadways.

3.03 TEMPORARY GRASSING

A. Provide a temporary cover for erosion control on disturbed areas that will remain unstabilized for a period of more than thirty (30) days in accordance with Section 32 92 00 – Turf and Grasses.

B. This practice applies to cleared areas, diversions, dams, temporary sediment basins, temporary road banks, and topsoil stockpiles where vegetation is needed for less than one (1) year.

C. Provide grassing on slope 5% or greater within fourteen (14) days of disturbance. Comply with Section 32 92 00 – Turf and Grasses.

3.04 SILT FENCE

A. Provide silt fence barrier where shown on the plans and on utility construction parallel to the disturbed trench where perpendicular sheet flow runoff occurs on disturbed areas with slopes greater than 4%.

B. Place at the extreme limits of the area to be disturbed as shown on the plans.

C. Construct temporary sediment barriers of filter fabric, buried at the bottom, stretched and supported by posts and install below small disturbed areas as indicated on the drawings to retain sediment by reducing the flow velocity to allow sediment deposition.

D. Provide spacing between posts 5'-0" on center, minimum.

E. Remove sediment deposits prior to reaching one-third height of the fence.

F. Monitor site frequently and place additional silt fencing should evidence indicate that erosion is about to occur at locations other than those shown on plan.

3.05 INLET PROTECTION

A. Construct temporary sediment barriers around storm drain curb inlets using block and gravel as indicated on the drawings.

B. Inspect structure after each rainfall and repair as required.

C. Remove sediment when trap reaches one-half capacity.

D. Remove structure when protected areas have been stabilized.

3.06 EROSION CONTROL BLANKET

A. Provide on areas as shown on the plans or on all embankments with slopes equal to or steeper than 2-1/2:1.

3.07 TEMPORARY STONE CHECK DAMS

A. Utilize temporary stone check dams as indicated on the plans or directed by Engineer.

B. Provide temporary stone check dams constructed of both rip-rap and #57 stone, as illustrated on the plans.

3.08 MAINTENANCE

A. Place all erosion control devices or measures prior to any land disturbing activity within the drainage area they are located.

B. Periodically check erosion control devices and clean or otherwise remove silt build-up as necessary to maintain them in proper working order.

3.09 REMOVAL

A. Remove temporary structures after protected areas have been stabilized.

3.10 MEASUREMENT AND PAYMENT

A. No separate measurement or direct payment will be made for the work under this Section and all costs for same shall be included in the lump sum bid.

END OF SECTION

SECTION 31 37 00

RIP RAP

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Furnishing all labor, materials, and equipment and performing all operations in conjunction with placing protective coatings of broken stone in accordance with these specifications and in conformity with the lines, grades and thicknesses shown on the plans or established by the Engineer.

1.02 RELATED REQUIREMENTS

A. Documents affecting work of this Section include, but are not necessarily limited to, General Conditions, and Sections in Division 1 of these Specifications.

B. Section 31 23 16 – Excavation

C. Section 31 23 23 - Fill and Backfill

D. Section 31 25 00 - Erosion and Sedimentation Control

1.03 QUALITY ASSURANCE

A. Perform Work in accordance with State of South Carolina Department of Transportation Highways standard.

B. Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this Section.

C. Maintain one copy of each document on site.

1.04 SUBMITTALS

A. Comply with pertinent provisions of Section 01 30 00.

PART 2 PRODUCTS

2.01 MATERIALS

A. Riprap: Granite type; broken stone; solid and nonfriable; 6 inch minimum size, 12 inch maximum size.

B. Aggregate: Granular fill as specified in Section 31 23 23.

C. Filter Fabric
   1. Comply with Section 31 25 00.

PART 3 EXECUTION

3.01 RIP-RAP PLACEMENT

A. Place riprap at culvert pipe ends, embankment slopes, and as indicated.

B. Where thickness is not shown on the plans, it shall be 12-inches.

C. The slope upon which this rip-rap is to be placed shall conform with the cross section shown on the plans or as directed by the Engineer.

D. Properly compact depressions that may be filled in trimming and shaping the slope.

E. Install filter fabric, lapping sides 12-inches.

F. Begin placing in a trench at least 2-feet below the toe of the slope.

G. Firmly imbed against the slope and the adjoining piece with the sides in contact and with broken joints.

H. Fill the spaces between the larger pieces with spalls of suitable size, thoroughly ram into place.

I. The finished surface shall present an even, tight surface true to line, grade and section.

3.02 MEASUREMENT AND PAYMENT

A. Payment will be made at the price per “Square Yard” as stated in the Bid Form for Erosion Control Measures.

B. Payment will be made at the price per “Each” as stated in the Bid Form for Erosion Control Measures.

END OF SECTION

SECTION 31 50 00

EXCAVATION SUPPORT AND PROTECTION

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Section includes temporary excavation support and protection systems.

B. Related Sections:

1. Division 01 Section "Temporary Facilities and Controls" for temporary utilities and support facilities.

1.03 PERFORMANCE REQUIREMENTS

A. Design, furnish, install, monitor, and maintain excavation support and protection system capable of supporting excavation sidewalls and of resisting soil and hydrostatic pressure and superimposed and construction loads.

1. Delegated Design: Design excavation support and protection system, including comprehensive engineering analysis by a licensed professional engineer in South Carolina, using performance requirements and design criteria indicated.

2. Prevent surface water from entering excavations by grading, dikes, dewatering or other means.

3. Install excavation support and protection systems without damaging existing buildings, structures and site improvements adjacent to excavation.

4. Monitor vibrations, settlements and movements.

1.04 SUBMITTALS

A. Shop Drawings: For excavation support and protection system.

B. Delegated-Design Submittal: For excavation support and protection system indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by a professional engineer licensed in South Carolina responsible for their preparation.

C. Coordinate first paragraph below with qualification requirements in Division 01 Section "Quality Requirements." Qualification Data: For qualified professional engineer.

D. Other Informational Submittals:

1. Photographs: Show existing conditions of adjacent construction and site improvements that might be misconstrued as damage caused by the absence of, the installation of, or the performance of excavation support and protection systems. Submit before Work begins.

2. Record Drawings: Identifying and locating capped utilities and other subsurface structural, electrical, or mechanical conditions.

a. Note locations and capping depth of wells and well points.

1.05 QUALITY ASSURANCE

A. Pre-installation Conference: Conduct conference at Project site.

1. Review methods and procedures related to excavation support and protection system including, but not limited to, the following:

a. Geotechnical report.

b. Existing utilities and subsurface conditions.

c. Proposed excavations.

d. Proposed equipment.

e. Monitoring of excavation support and protection system.

f. Working area location and stability.

g. Coordination with waterproofing.

h. Abandonment or removal of excavation support and protection system.

1.06 PROJECT CONDITIONS

A. Interruption of Existing Utilities: Do not interrupt any utility serving facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary utility according to requirements indicated:

1. Notify Owner no fewer than two days in advance of proposed interruption of utility.

2. Do not proceed with interruption of utility without Owner's written permission.

B. Project-Site Information: A geotechnical report has been prepared for this Project and is available for information only. The opinions expressed in this report are those of geotechnical engineer and represent interpretations of subsoil conditions, tests, and results of analyses conducted by geotechnical engineer. Owner will not be responsible for interpretations or conclusions drawn from the data.

1. Make additional test borings and conduct other exploratory operations necessary for excavation support and protection.

2. The geotechnical report is included elsewhere in the Project Manual.

C. Survey Work: Engage a qualified land surveyor to survey adjacent existing buildings, structures, and site improvements; establish exact elevations at fixed points to act as benchmarks. Clearly identify benchmarks and record existing elevations.

1. During installation of excavation support and protection systems, regularly resurvey benchmarks, maintaining an accurate log of surveyed elevations and positions for comparison with original elevations and positions. Promptly notify Engineer if changes in elevations or positions occur or if cracks, sags, or other damage is evident in adjacent construction.

PART 2 PRODUCTS

2.01 MATERIALS

A. General: Provide materials that are either new or in serviceable condition.

B. Structural Steel: ASTM A 36, ASTM A 690, or ASTM A 992.

C. Steel Sheet Piling: ASTM A 328, ASTM A 572, or ASTM A 690; with continuous interlocks.

1. Corners: Site-fabricated mechanical interlock.

D. Shotcrete: Comply with "Shotcrete" Section in Specification 03 46 01 for shotcrete materials and mixes, reinforcement, and shotcrete application.

E. Cast-in-Place Concrete: ACI 301, of compressive strength required for application.

F. Reinforcing Bars: ASTM A 615, Grade 60, deformed.

G. Tiebacks: Steel bars, ASTM A 722.

H. Tiebacks: Steel strand, ASTM A 416.

PART 3 EXECUTION

3.01 PREPARATION

A. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards that could develop during excavation support and protection system operations.

1. Shore, support, and protect utilities encountered.

B. Install excavation support and protection systems to ensure minimum interference with roads, streets, walks, and other adjacent occupied and used facilities.

1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction. Provide alternate routes around closed or obstructed traffic ways if required by authorities having jurisdiction.

C. Locate excavation support and protection systems clear of permanent construction so that forming and finishing of concrete surfaces are not impeded.

D. Monitor excavation support and protection systems daily during excavation progress and for as long as excavation remains open. Promptly correct bulges, breakage, or other evidence of movement to ensure that excavation support and protection systems remain stable.

E. Promptly repair damages to adjacent facilities caused by installing excavation support and protection systems.

3.02 SOLDIER PILES AND LAGGING

A. Install steel soldier piles before starting excavation. Extend soldier piles below excavation grade level to depths adequate to prevent lateral movement. Space soldier piles at regular intervals not to exceed allowable flexural strength of wood lagging. Accurately align exposed faces of flanges to vary not more than 2 inches from a horizontal line and not more than 1:120 out of vertical alignment.

B. Install wood lagging within flanges of soldier piles as excavation proceeds. Trim excavation as required to install lagging. Fill voids behind lagging with soil, and compact.

C. Install wales horizontally at locations indicated on Drawings and secure to soldier piles.

3.03 SHEET PILING

A. Before starting excavation, install one-piece sheet piling lengths and tightly interlock to form a continuous barrier. Accurately place the piling, using templates and guide frames unless otherwise recommended in writing by the sheet piling manufacturer. Limit vertical offset of adjacent sheet piling to 60 inches. Accurately align exposed faces of sheet piling to vary not more than 2 inches from a horizontal line and not more than 1:120 out of vertical alignment. Cut tops of sheet piling to uniform elevation at top of excavation.

3.04 TIEBACKS

A. Tiebacks: Drill, install, grout, and tension tiebacks. Test load-carrying capacity of each tieback and replace and retest deficient tiebacks.

1. Test loading shall be observed by a qualified professional engineer responsible for design of excavation support and protection system.

2. Maintain tiebacks in place until permanent construction is able to withstand lateral soil and hydrostatic pressures.

3.05 BRACING

A. Bracing: Locate bracing to clear columns, floor framing construction, and other permanent work. If necessary to move brace, install new bracing before removing original brace.

1. Do not place bracing where it will be cast into or included in permanent concrete work unless otherwise approved by Engineer.

2. Install internal bracing, if required, to prevent spreading or distortion of braced frames.

3. Maintain bracing until structural elements are supported by other bracing or until permanent construction is able to withstand lateral earth and hydrostatic pressures.

3.06 REMOVAL AND REPAIRS

A. Remove excavation support and protection systems when construction has progressed sufficiently to support excavation and bear soil and hydrostatic pressures. Remove in stages to avoid disturbing underlying soils or damaging structures, pavements, facilities, and utilities.

1. Remove excavation support and protection systems to a minimum depth of 48 inches below overlaying construction and abandon remainder.

2. Fill voids immediately with approved backfill compacted to density specified in Division 31 Section "Earth Moving."

3. Repair or replace, as approved by Engineer, adjacent work damaged or displaced by removing excavation support and protection systems.

B. Leave excavation support and protection systems permanently in place.

3.07 MEASUREMENT AND PAYMENT

A. No separate measurement or direct payment will be made for the work under this Section and all costs for same shall be included in the price bid for the item to which it pertains.

END OF SECTION

SECTION 32 11 23

AGGREGATE BASE COURSE

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Stone Base Course.

B. Paving aggregates.

1.02 RELATED REQUIREMENTS

A. Documents affecting work of this Section include, but are not necessarily limited to Sections in Division 1 of these Specifications.

B. Section 31 22 00 - Grading: Preparation of site for base course.

C. Section 31 23 23.13 – Backfill and Compaction: Topsoil fill at areas adjacent to aggregate base course.

D. Section 31 23 16.13 – Trenching for Site Utilities: Compacted fill over utility trenches under base course.

E. Section 32 13 13 - Bituminous Concrete Paving: Binder and finish asphalt courses.

1.03 REFERENCE STANDARDS

A. AASHTO M 147 - Standard Specification for Materials for Aggregate and Soil-Aggregate Subbase, Base and Surface Courses; American Association of State Highway and Transportation Officials; 1965 (2012).

B. AASHTO T 180 - Standard Specification for Moisture-Density Relations of Soils Using a 4.54 kg (10-lb) Rammer and a 457 mm (18 in.) Drop; American Association of State Highway and Transportation Officials; 2010

C. ASTM C136 - Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates; 2006.

D. ASTM D698 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft3 (600 kN-m/m3)); 2012.

E. ASTM D1556 - Standard Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method; 2007.

F. ASTM D1557 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft3 (2,700 kN m/m3)); 2012.

G. ASTM D2167 - Standard Test Method for Density and Unit Weight of Soil in Place by the Rubber Balloon Method; 2008.

H. ASTM D2487 - Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System); 2011.

I. ASTM D 2922 - Standard Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth); 2005.

J. ASTM D3017 - Standard Test Method for Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth); 2005.

K. ASTM D4318 - Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils; 2010.

1.04 QUALITY ASSURANCE

A. Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this Section.

1.05 PRODUCT HANDLING

A. Comply with pertinent provisions of Section 01 66 00.

1.06 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Samples: 10 lb sample of each type of aggregate; submit in air-tight containers to testing laboratory.

C. Materials Sources: Submit name of imported materials source.

D. Aggregate Composition Test Reports: Results of laboratory tests on proposed and actual materials used.

E. Compaction Density Test Reports.

1.07 DELIVERY, STORAGE, AND HANDLING

A. When necessary, store materials on site in advance of need.

B. Aggregate Storage, General:

1. Separate differing materials with dividers or stockpile separately to prevent intermixing.

2. Prevent contamination.

3. Protect stockpiles from erosion and deterioration of materials.

C. Verify that survey benchmarks and intended elevations for the Work are as indicated.

PART 2 PRODUCTS

2.01 MATERIALS

A. Coarse Aggregate Type retained on No. 4 sieve: Coarse aggregate, conforming to State of South Carolina Highway Department standard.

1. Furnish a coarse aggregate consisting of hard, durable particles of stone, reasonably free from soft, thin, elongated or laminated pieces and deleterious substances.

2. Furnish aggregate with an abrasion loss of less than 65% as measured by the Los Angeles Abrasion Test.

B. Fine Aggregate: Natural river or bank sand; washed; free of silt, clay, loam, friable or soluble materials, and organic matter.

1. Furnish a fine aggregate consisting of material produced by stone crushing operations.

2. Liquid limit shall not exceed 25 and the plasticity index shall not exceed 6 when tested in accordance with AASH TO T-89 and T-90, respectively.

3. Grade in accordance with ASTM D2487 Group Symbol SW.

4. Graded in accordance with ASTM C136; within the following limits:

a. No. 4 sieve: 100 percent passing.

b. No. 14 sieve: 10 to 100 percent passing.

c. No. 50 sieve: 5 to 90 percent passing.

d. No. 100 sieve: 4 to 30 percent passing.

e. No. 200 sieve: 0 percent passing.

C. Composite Mixture:

1. Produce in one crushing operation or by blending the fine and coarse aggregate in proper proportions.

2. Graded in accordance with ASTM C136; within the following limits:

a.	No. 2-0" Sieve	100 Percent Passing
b.	No. 1-1/2" Sieve	95-100 Percent Passing
c.	No. 1-0" Sieve	70-100 Percent Passing
d.	No. 0-1/2" Sieve	48-75 Percent Passing
e.	No. 4 Sieve	30-50Percent Passing
f.	No. 30 Sieve	11-30 Percent Passing
g.	No. 200 Sieve	0-12 Percent Passing
h.	Liquid Limit	25 max.
i.	Plasticity Index	6 max.

D. Provide Aggregate Type Materials that comply with Section 305 of the South Carolina Department of Transportation Standard Specifications for Highway Construction, Latest Edition.

2.02 SOURCE QUALITY CONTROL

A. See Section 01 40 00 - Quality Requirements, for general requirements for testing and analysis of aggregate materials.

B. Where aggregate materials are specified using ASTM D2487 classification, test and analyze samples for compliance before delivery to site.

C. Where aggregate materials are specified using ASTM D2487 classification, testing of samples for compliance will be provided before delivery to site.

D. If tests indicate materials do not meet specified requirements, change material and retest.

E. Provide materials of each type from same source throughout the Work.

2.03 PRIME ASPHALT

A. Use either MC-30, RC-30, RC-70, or EA-P complying with requirements of Sections 406, 407 and 408 of the South Carolina Department of Transportation specifications.

PART 3 EXECUTION

3.01 EXAMINATION

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

B. Verify substrate has been inspected, gradients and elevations are correct, and is dry.

3.02 PREPARATION

A. Correct irregularities in substrate gradient and elevation by scarifying, reshaping, and recompacting.

B. Do not place aggregate on soft, muddy, or frozen surfaces.

C. Proofroll all areas to receive crushed stone paving.

1. Make not less than three passes over the full area, using a 35 to 50 ton rubber tired roller.

D. Remove all soft, unstable or unsuitable material that will not compact readily.

1. Remove to full depth of unsuitable material, or to a depth of 30-inches, whichever is less.

2. Replace with satisfactory materials.

E. Fill all holes, ruts or depressions which develop in the subgrade with approved on-site material, bringing subgrade to indicated line and grades.

F. Compact subgrade using suitable construction procedures to provide not less than 95% Standard Proctor Maximum Dry Density.

G. Seal roll the subgrade surface with a steel wheel roller, sealing the surface against excessive water infiltration.

H. Preparation of Subgrade

1. Proofroll all areas to receive crushed stone paving.

a. Make not less than three passes over the full area, using a 35 to 50 ton rubber tired roller.

2. Remove all soft, unstable or unsuitable material that will not compact readily.

a. Remove to full depth of unsuitable material, or to a depth of 30-inches, whichever is less.

b. Replace with satisfactory materials.

3. Fill all holes, ruts or depressions which develop in the subgrade with approved on-site material, bringing subgrade to indicated line and grades.

4. Compact subgrade using suitable construction procedures to provide not less than 95% Standard Proctor Maximum Dry Density.

5. Seal roll the subgrade surface with a steel wheel roller, sealing the surface against excessive water infiltration.

3.03 INSTALLATION

A. Spread aggregate over prepared substrate to a total compacted thickness of 6 inches.

B. Under Bituminous Concrete Paving:

1. Compact to 95 percent of maximum dry density.

C. Place aggregate in maximum 4-inch layers and roller compact to specified density.

D. Place aggregates using spreader boxes or other approved spreaders uniformly on one operation.

E. Take care to avoid segregation of the fine from the coarse aggregate during handling, spreading or shaping operations.

F. Mix, while at proper moisture, with motor grader or other equipment and maintain to required section and grade until thoroughly compacted.

G. Level and contour surfaces to elevations and gradients indicated.

H. Add small quantities of fine aggregate to coarse aggregate as appropriate to assist compaction.

I. Add water to assist compaction. If excess water is apparent, remove aggregate and aerate to reduce moisture content.

J. Perform using 3-wheel steel wheel roller weighing not less than 10-tons, tandem roller weighing at least 8-tons, or other rollers approved by the Engineer.

K. Start rolling at edges and proceed toward the center, continue rolling until aggregates are firmly keyed or set.

L. When initial compaction is completed, should voids remain, place fine aggregates on the surface in an amount only sufficient to fill the voids.

M. Broom, wet and roll until coarse aggregate is set, bonded and thoroughly compacted for full width and depth.

N. Use mechanical tamping equipment in areas inaccessible to compaction equipment.

O. Apply herbicide to finished surface.

3.04 TOLERANCES

A. Thickness tolerance: Provide the compacted thicknesses shown on the Drawings within a tolerance of minus 1/2-inch.

1. Depth measurements will be made by digging through the base at intervals no closer than 250-feet, nor greater than 500-feet apart.

2. Where thickness is less than depth specified minus 1/2-inch, it shall be corrected as directed by the Engineer.

B. Variation From Design Elevation: Within 3/8- inch in 10-feet, parallel to the center line of the roadway nor more than 1/2-inch from a template conforming to the cross-sections illustrated on the Construction Plans.

C. Deviations: Correct by removing materials, replacing with new materials, and reworking or recompacting as required.

3.05 FIELD QUALITY CONTROL

A. Compaction density testing will be performed on compacted aggregate base course in accordance with ASTM D1556.

B. Compaction density testing will be performed on compacted aggregate base course in accordance with South Carolina Department of Transportation Standard Specifications for Highway Construction, Latest Edition.

C. Results will be evaluated in relation to compaction curve determined by testing uncompacted material in accordance with ASTM D698 ("standard Proctor").

D. If tests indicate work does not meet specified requirements, remove work, replace and retest.

E. Proof roll compacted aggregate at surfaces that will be under slabs-on-grade.

F. Allow no traffic on surface until mixture has hardened sufficiently to prevent distortion.

3.06 PLACING PRIME COAT

A. Allow base course to season sufficiently to permit uniform penetration.

B. Do not apply to wet surfaces or when the temperature is below 60ºF in the shade and falling, or below 55ºF in the shade and rising.

C. Clean surfaces of all dust, dirt, clay, etc. using mechanical brooms, etc.

D. Apply prime material, using pneumatic mounted distributors, at a rate of 0.25 to 0.30 gallon per square yard.

E. Permit no traffic on primed surfaces until bituminous material has penetrated and dried sufficiently that it does not pick up under traffic.

3.07 CLEANING

A. Leave unused materials in a neat, compact stockpile.

B. Remove unused stockpiled materials, leave area in a clean and neat condition. Grade stockpile area to prevent standing surface water.

C. Leave borrow areas in a clean and neat condition. Grade to prevent standing surface water.

D. Allow no traffic on surface until mixture has hardened sufficiently to prevent distortion.

END OF SECTION

SECTION 32 13 13

BITUMINOUS CONCRETE PAVING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Aggregate base course.

B. Single course asphaltic concrete paving.

C. Double course bituminous concrete paving.

D. Surface sealer.

1.02 RELATED REQUIREMENTS

A. Documents affecting work of this Section include, but are not necessarily limited to, General Conditions, and Sections in Division 1 of these Specifications.

B. Section 31 22 00 - Grading.

C. Section 31 23 23.13 – Backfill and Compaction.

D. Section 32 11 23 - Aggregate Base Course.

1.03 REFERENCE STANDARDS

A. AI MS-2 - Mix Design Methods for Asphalt Concrete and Other Hot-Mix Types; The Asphalt Institute; 1997.

B. AI MS-19 - A Basic Asphalt Emulsion Manual; The Asphalt Institute; Fourth Edition.

C. ASTM D946 - Standard Specification for Penetration-Graded Asphalt Cement for Use in Pavement Construction; 2009a.

1.04 QUALITY ASSURANCE

A. Perform Work in accordance with State of South Carolina Department of Transportation Highways standard.

B. Mixing Plant: Conform to State of South Carolina Department of Transportation Highways standard.

C. Obtain materials from same source throughout.

D. Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this Section.

1.05 REGULATORY REQUIREMENTS

A. Conform to applicable code for paving work on public property.

1.06 SUBMITTALS

A. Comply with pertinent provisions of Section 01 30 00.

B. Product data: Within fourteen (14) calendar days after the Contractor has received the Owner's Notice to Proceed, submit:

1. Materials list of items proposed to be provided under this Section.

2. Certificates, signed by the materials producer and the asphalt paving Subcontractor, stating that materials meet or exceed the specified requirements.

1.07 PRODUCT HANDLING

A. Comply with pertinent provisions of Section 01 66 00.

1.08 FIELD CONDITIONS

A. Do not place asphalt when ambient air or base surface temperature is less than 40 degrees F in the shade and falling, or below 35ºF in the shade and rising, or if surface is wet or frozen.

B. Place bitumen mixture when temperature is not more than 15 F degrees below bitumen supplier's bill of lading and not more than maximum specified temperature.

PART 2 PRODUCTS

2.01 MATERIALS

A. Asphalt Cement: ASTM D946.

B. All Materials: In accordance with State of South Carolina Department of Transportation Highways standards.

C. All Materials: In accordance with State of South Carolina Department of Transportation Standard Specifications for Highway Construction, latest Edition.

D. Aggregate for Base Course: Angular crushed washed stone; free of shale, clay, friable material and debris.

1. Graded in accordance with ASTM D2487 Group Symbol GW.

2. Graded in accordance with ASTM C136, within the following limits:

a. 2 inch sieve: 100 percent passing.

b. 1 inch sieve: 95 percent passing.

c. 3/4 inch sieve: 95 to 100 percent passing.

d. 5/8 inch sieve: 75 to 100 percent passing.

e. 3/8 inch sieve: 55 to 85 percent passing.

f. No. 4 sieve: 35 to 60 percent passing.

g. No. 16 sieve: 15 to 35 percent passing.

h. No. 40: 10 to 25 percent passing.

i. No. 200: 5 to 10 percent passing.

E. Aggregate for Binder Course: Angular crushed washed stone; free of shale, clay, friable material and debris.

1. Graded in accordance with ASTM D2487 Group Symbol GW.

2. Graded in accordance with ASTM C136, within the following limits:

a. 2 inch sieve: 100 percent passing.

b. 1 inch sieve: 95 percent passing.

c. 3/4 inch sieve: 95 to 100 percent passing.

d. 5/8 inch sieve: 75 to 100 percent passing.

e. 3/8 inch sieve: 55 to 85 percent passing.

f. No. 4 sieve: 35 to 60 percent passing.

g. No. 16 sieve: 15 to 35 percent passing.

h. No. 40: 10 to 25 percent passing.

i. No. 200: 5 to 10 percent passing.

F. Fine Aggregate: In accordance with State of South Carolina Department of Transportation Highways standards.

G. Mineral Filler: Finely ground particles of limestone, hydrated lime or other mineral dust, free of foreign matter.

H. Primer: In accordance with State of South Carolina Department of Transportation Highways standards.

I. Tack Coat: Homogeneous, medium curing, liquid asphalt.

2.02 ASPHALT PAVING MIXES AND MIX DESIGN

A. Use dry material to avoid foaming. Mix uniformly.

B. Base Course: 3.0 to 6 percent of asphalt cement by weight in mixture in accordance with AI MS-2.

C. Binder Course: 4.5 to 6 percent of asphalt cement by weight in mixture in accordance with AI MS-2.

D. Submit proposed mix design of each class of mix for review prior to beginning of work.

2.03 ASPHALTIC CONCRETE MIXTURE (BINDER COURSE)

A. Materials and composition of mixture shall comply with Section 402 of the SCDOT's "Standard Specifications for Type 1 Mix".

B. Provide hot plant mixed asphaltic concrete paving materials.

1. Temperature leaving the plant: 290ºF minimum, 320ºF maximum.

2. Temperature at time of placing: 280ºF minimum.

2.04 ASPHALTIC CONCRETE MIXTURE (SURFACE COURSE)

A. Materials and composition of mixture shall comply with Section 403 of the SCDOT's "Standard Specifications for Type B Mix."

B. Provide hot plant mixed asphaltic concrete paving materials.

1. Temperature leaving the plant: 290ºF minimum, 320ºF maximum.

2. Temperature at time of placing: 280ºF minimum.

2.05 EQUIPMENT

A. Comply with requirements of Section 401 of SCDOT's "Standard Specifications".

2.06 SOURCE QUALITY CONTROL

A. Test mix design and samples in accordance with AI MS-2.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that compacted subgrade is dry and ready to support paving and imposed loads.

B. Verify gradients and elevations of base are correct.

3.02 SURFACE CONDITIONS

A. Examine the areas and conditions under which work of this Section will be performed. Correct conditions detrimental to timely and proper completion of the Work. Do not proceed until unsatisfactory conditions are corrected.

1. Sweep primed surfaces if needed.

2. Adjust frames and covers if needed.

3.03 BASE COURSE

A. Place and compact base course.

B. On arrival at point of use, dump directly into mechanical spreader.

C. Immediately spread and strike off true to the line, grade and cross section indicated, to such loose depth that when work is completed, the indicated thickness or weight per square yard will be secured.

D. Correct irregularities while the mixture is still hot.

E. At locations not readily accessible to mechanical spreaders, acceptable hand spreading methods may be used.

F. Finished surfaces placed adjacent to curbs, gutters, manholes, etc., shall be approximately 1/4-inch above the edges of these structures.

G. Section 02721 - Aggregate Base Course.

3.04 COMPACTION

A. Perform initial rolling with 3-wheel steel roller or a steel wheel 2-axle tandem roller.

B. Follow initial rolling with at least four complete coverages by a pneumatic tired roller.

C. Complete rolling with steel wheel 2-axle tandem roller.

D. Rolling shall start longitudinally at the sides and proceed gradually toward the center of the pavement, overlapping on successive trips approximately 1/2 the width of the roller.

E. Use hand or mechanical tampers in areas not accessible to powered rollers.

F. Surface mixture after compaction shall be smooth and true to the established crown and grade.

3.05 PREPARATION – PRIMER

A. Apply primer in accordance with manufacturer's instructions.

B. Apply primer on aggregate base or sub-base at uniform rate of 1/3 gal/sq yd.

C. Use clean sand to blot excess primer.

3.06 PREPARATION - TACK COAT

A. Apply tack coat in accordance with manufacturer's instructions.

B. Apply tack coat on asphalt or concrete surfaces over subgrade surface at uniform rate of 1/3 gal/sq yd.

C. Apply tack coat to contact surfaces as required.

D. Coat surfaces of manhole frames with oil to prevent bond with asphalt pavement. Do not tack coat these surfaces.

3.07 SEAL COAT

A. Apply seal coat to surface course and asphalt curbs in accordance with AI MS-19.

3.08 TOLERANCES

A. Flatness: Maximum variation of 1/4 inch measured with 10 foot straight edge.

B. Compacted Thickness: Within 1/4 inch of specified or indicated thickness.

C. Variation from True Elevation: Within 1/8 inch, in 6-feet.

D. Free from Bird Baths.

3.09 FIELD QUALITY CONTROL

A. See Section 01 40 00 - Quality Requirements, for general requirements for quality control.

B. Provide field inspection and testing. Take samples and perform tests in accordance with AI MS-2.

C. Flood Test

1. Flood the entire asphaltic concrete paved area with water by use of a tank truck or hoses.

2. If a depression is found where water ponds to a depth of more than 1/8-inch in 6-feet, fill or otherwise correct to provide proper drainage.

3. Feather and smooth the edges of fill so that the joint between fill and original surface is invisible.

3.10 PROTECTION

A. Allow no traffic on surface until the mixture has hardened sufficiently to prevent distortion.

3.11 SCHEDULE

A. Pavement at Truck Ramp and Garbage Area: Single course of 3-1/2 inch compacted thickness, sand seal coat.

B. Pavement at Parking Areas: Two courses; binder course of 2-1/2 inch compacted thickness and wearing course of 1 inch compacted thickness, fog seal coat.

C. Pavement at Rear Bus Loading Area: Thickness and compaction of subbase to support vehicles up to 30,000 lb.

D. Pavement Front Sidewalks: Thickness and compaction of subbase to support moderate pedestrian traffic.

END OF SECTION

SECTION 32 17 23
PAVEMENT MARKINGS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Parking lot markings, including parking bays, crosswalks, arrows, handicapped symbols, and curb markings.

B. Roadway lane markings and crosswalk markings.

C. "No Parking" curb painting.

1.02 RELATED REQUIREMENTS

A. Section 02741 - Bituminous Concrete Paving.

B. Section 02751 - Portland Cement Concrete Paving.

C. Section 02767 - Tactile Warning Surfacing: Plastic tactile and detectable warning tiles for pedestrian walking surfaces.

1.03 PRICE AND PAYMENT PROCEDURES

A. See Section 01210 - Allowances, for cash allowances affecting this section.

B. See Section 01270 - Unit Prices, for additional unit price requirements.

C. See Section 01230 - Alternatives, for product alternates affecting this section.

1.04 REFERENCE STANDARDS

A. FS TT-B-1325 - Beads (Glass Spheres); Retro-Reflective; Rev. D, 2007.

B. FS TT-P-1952 - Paint, Traffic Black, and Airfield Marking, Waterborne; Rev. E, 2007.

C. MPI (APL) - Master Painters Institute Approved Products List; Master Painters and Decorators Association; current edition, www.paintinfo.com.

D. FHWA MUTCD - Manual on Uniform Traffic Control Devices for Streets and Highways; U.S. Department of Transportation, Federal Highway Administration; http://mutcd.fhwa.dot.gov; current edition.

1.05 SUBMITTALS

A. See Section 01300 - Administrative Requirements, for submittal procedures.

B. Product Data: Manufacturer's data sheets on each product to be used, including:
   1. Preparation instructions and recommendations.
   2. Storage and handling requirements and recommendations.
   3. Installation methods.

C. Certificates: Submit for each batch of paint and glass beads stating compliance with specified requirements.

D. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 01600 - Product Requirements, for additional provisions.
   2. Extra Paint: 2 containers, 1 gallon size, of each type and color.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver paint in containers of at least 5 gallons accompanied by batch certificate.

B. Deliver glass beads in containers suitable for handling and strong enough to prevent loss during shipment accompanied by batch certificate.

C. Store products in manufacturer's unopened packaging until ready for installation.

D. Store and dispose of solvent-based materials, and materials used with solvent-based materials, in accordance with requirements of local authorities having jurisdiction.

1.07 FIELD CONDITIONS

A. Do not install products under environmental conditions outside manufacturer's absolute limits.

PART 2 PRODUCTS

2.01 MATERIALS

A. Line and Zone Marking Paint: MPI No. 97 Latex Traffic Marking Paint; color(s) as indicated.
   1. Roadway Markings: As required by authorities having jurisdiction.
   2. Parking Lots: Yellow.
   3. Handicapped Symbols: Blue.

B. Line and Zone Marking Paint: Refer to Section 09900.

C. Paint For Obliterating Existing Markings: FS TT-P-1952; black for bituminous pavements, gray for portland cement pavements.

D. Reflective Glass Beads: FS TT-B-1325, Type I (low index of refraction), Gradation A (coarse, drop-on); with silicone or other suitable waterproofing coating to ensure free flow.

E. Temporary Marking Tape: Preformed, reflective, pressure sensitive adhesive tape in color(s) required; Contractor is responsible for selection of material of sufficient durability as to perform satisfactorily during period for which its use is required.

F. Tactile Warning Surfaces: See Section 02767.

PART 3 EXECUTION

3.01 EXAMINATION

A. Do not begin installation until substrates have been properly prepared.

B. If substrate preparation is the responsibility of another installer, notify Engineer of unsatisfactory preparation before proceeding.

3.02 PREPARATION

A. Allow new pavement surfaces to cure for a period of not less than 14 days before application of marking materials.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

C. Obliteration of existing markings using paint is acceptable in lieu of removal; apply the black paint in as many coats as necessary to completely obliterate the existing markings.

D. Clean surfaces thoroughly prior to installation.
   1. Remove dust, dirt, and other granular surface deposits by sweeping, blowing with compressed air, rinsing with water, or a combination of these methods.
   2. Completely remove rubber deposits, existing paint markings, and other coatings adhering to the pavement, by scraping, wire brushing, sandblasting, mechanical abrasion, or approved chemicals.
   3. Sandblasting: Use equipment of size and capacity necessary, providing not less than 150 cfm of air at pressure not less than 90 psi at each nozzle used.

E. Where oil or grease are present, scrub affected areas with several applications of trisodium phosphate solution or other approved detergent or degreaser, and rinse thoroughly after each application; after cleaning, seal oil-soaked areas with cut shellac to prevent bleeding through the new paint.

F. Establish survey control points to determine locations and dimensions of markings; provide templates to control paint application by type and color at necessary intervals.

G. Temporary Pavement Markings: When required or directed by Engineer, apply temporary markings of the color(s), width(s) and length(s) as indicated or directed.
   1. After temporary marking has served its purpose, remove temporary marking by carefully controlled sandblasting, approved grinding equipment, or other approved method so that surface to which the marking was applied will not be damaged.

2. At Contractor's option, temporary marking tape may used in lieu of temporary painted marking; remove unsatisfactory tape and replace with painted markings at no additional cost to Owner.

3.03 INSTALLATION

A. Begin pavement marking as soon as practicable after surface has been cleaned and dried.

B. Do not apply paint if temperature of surface to be painted or the atmosphere is less than 50 degrees F or more than 95 degrees F.

C. Apply in accordance with manufacturer's instructions using an experienced technician that is thoroughly familiar with equipment, materials, and marking layouts.

D. Comply with FHWA MUTCD manual (http://mutcd.fhwa.dot.gov) for details not shown.

E. Apply markings in locations determined by measurement from survey control points; preserve control points until after markings have been accepted.

F. Apply uniformly painted markings of color(s), lengths, and widths as indicated on the drawings true, sharp edges and ends.
   1. Apply paint in one coat only.
   2. Wet Film Thickness: 0.015 inch, minimum.
   3. Length Tolerance: Plus or minus 3 inches.
   4. Width Tolerance: Plus or minus 1/8 inch.

G. Roadway Traffic Lanes: Use suitable mobile mechanical equipment that provides constant agitation of paint and travels at controlled speeds.
   1. Conduct operations in such a manner that necessary traffic can move without hindrance.
   2. Place warning signs at the beginning of the wet line, and at points well in advance of the marking equipment for alerting approaching traffic from both directions. Place small flags or other similarly effective small objects near freshly applied markings at frequent intervals to reduce crossing by traffic.
   3. If paint does not dry within expected time, discontinue paint operations until cause of slow drying is determined and corrected.
   4. Skip Markings: Synchronize one or more paint "guns" to automatically begin and cut off paint flow; make length of intervals as indicated.
   5. Use hand application by pneumatic spray for application of paint in areas where a mobile paint applicator cannot be used.
   6. Distribute glass beads uniformly on the paint lines within ten seconds without any waste, applied at rate of 6 pounds per gallon of paint; if the marking equipment does not have a glass bead dispenser, use a separate piece of equipment adjusted and synchronized with the paint applicator; remove and replace markings having faulty distribution of beads.

H. Parking Lots: Apply parking space lines, entrance and exit arrows, painted curbs, and other markings indicated on drawings.
   1. Mark the International Handicapped Symbol at indicated parking spaces.
   2. Hand application by pneumatic spray is acceptable.

I. Symbols: Use a suitable template that will provide a pavement marking with true, sharp edges and ends, of the design and size indicated.

3.04 DRYING, PROTECTION, AND REPLACEMENT

A. Protect newly painted markings so that paint is not picked up by tires, smeared, or tracked.

B. Provide barricades, warning signs, and flags as necessary to prevent traffic crossing newly painted markings.

C. Allow paint to dry at least the minimum time specified by the applicable paint standard and not less than that recommended by the manufacturer.

D. Remove and replace markings that are applied at less than minimum material rates; deviate from true alignment; exceed length and width tolerances; or show light spots, smears, or other deficiencies or irregularities.

E. Remove markings in manner to avoid damage to the surface to which the marking was applied, using carefully controlled sand blasting, approved grinding equipment, or other approved method.

F. Replace removed markings at no additional cost to Owner.

END OF SECTION

SECTION 32 18 23.13

INFIELD SURFACING

PART 1: GENERAL

1.1 SECTION INCLUDES

A. Section Includes: Supply and installation of a complete infield skin surface, including pitcher's mound, batter's box, and warning track mixes including:

1. PROGold Premium Infield Mix (or equal)
2. PROGold Premium Mound and Homeplate Mix (or equal)
3. PROGold Premium Warning Track Mix (or equal)

1.2 RELATED SECTIONS

A. Section 31 00 00 – Earthwork
B. Section 32 92 00 – Turf and Grasses
C. Section 32 31 13 – Chain Link Fence

1.3 REFERENCES

A. ASTM F-1632: Standard Test Method for Particle Size Analysis
B. ASTM D- 422: Standard Test Method for Fine Particle Size Analysis

1.4 SUBMITTALS

A. Submit in accordance with Section 01 33 00 - Submittal Procedures:

1. Manufacturer's product data sheet and installation instructions for each product to be used.
2. 5-pound sample for each product to be used along with a private lab test indicating the particle size analysis of the material. All tests shall be performed in accordance with ASTM F-1632.
3. Manufacturer's maintenance and cleaning instructions for each product to be used.

1.5 PROJECT / SITE CONDITIONS

A. All Earthwork shall be performed in accordance with the preceding sections.
B. Sub base material shall be uniformly graded and compacted and shall mirror finish grade contours to ensure an even depth of material.
C. Spot check by survey subgrade elevations prior to placement of material.
D. Construct skin surfaces with a finish grade that provides adequate surface drainage, ideally 0.5 to 1.5% slope away from the center of the infield.

PART 2: PRODUCTS

2.1 MATERIALS

A PROGold Premium Infield Mix, PROGold Premium Mound and Homeplate Mix and ProGOLD Premium Warning Track Mix engineered soil products (or equal) produced by Gail Materials, Corona, CA; phone 951-667-6106; fax 951-667-6102; www.gailmaterials.net.

1. Requests for substitutions will be considered in accordance with provisions of section 01 23 00 Substitution Procedures.

B. PROGold Premium Infield Mix (or equal):

1. Gradation: A minimum of 98% of particles shall pass the 2.00 mm sieve with the highest portion of sand particles in the medium to very fine range. Silt and Clay distribution shall be relatively equal with the ratio of silt to clay .5 – 1.2. The final soil classification based on USDA criteria shall be a "sandy loam – sandy clay loam".
2. Color: "Gold" to "Reddish Gold".

C. PROGold Premium Mound and Homeplate Mix (or equal):

1. Gradation: Minimum clay content of 38% by weight as determined by ASTM D422 methodology.
2. Color: "Grey", "Tan", "Brown", "Red" or "Reddish Brown".

D. PROGold Premium Warning Track Mix (or equal):

1. Gradation: 50-75% crushed-screen 3/16 inch minus decomposed granite fines and 25-50% Cinder Sand.

Sieve	Percent Passing
3/16"	95 - 100%
No. 4	90-100%
No. 30	25-60%
No. 200	5-20%

2. Binder: Natracil™ organic binder by Gail Materials, Corona, CA; phone 951-667-6106; fax 951-667-6102; www.gailmaterials.net. Binder shall have a minimum swell volume of 35 ml/gm and shall be blended with a pug mill that includes a weight belt feeder that insures the proper ratio and the uniform blending of the binder. Bucket of Belt blending are not acceptable methods.
3. Color: "Gold" to "Reddish Brown".

PART 3: EXECUTION

3.1 Placement

A. Infield surfacing shall be installed in strict conformance with the manufacturer's specifications to the lines and grades as shown in the Drawings.

B. New Fields: Place material to a final minimum depth of 4 inches when finished and compacted. The final grade should be leveled and sloped according to standard infield construction specifications. Allow for +/- 1 inch for compaction.

3.2 Watering

A. After leveling the infield skin thoroughly water the entire infield surface until the complete depth of the infield mix is moistened. After a period of +/- 4 hours compact with a minimum 2000 lb. static drum roller. If low areas are present, scarify and level low areas with additional infield mix.

3.3 Inspection

A. The finished surface of the infield shall be smooth and free from any visible dips, humps, bumps for other blemishes which would hinder the removal of water through positive surface drainage. Correct irregularities to the satisfaction of the Engineer.

B. Conduct finished elevation survey to assure proper installation if there are irregulatires.

3.4 Topdressing

A. Following successful inspection, topdressing may be applied, consisting of a calcified clay product added at a rate of one 50-pound bag per 100 square ft.

END OF SECTION

SECTION 32 31 13
CHAIN LINK FENCES AND GATES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Fence framework, fabric, and accessories.

B. Excavation for post bases; concrete foundation for posts.

C. Manual gates and related hardware.

1.02 RELATED REQUIREMENTS

A. Section 03300 - Cast-in-Place Concrete: Concrete anchorage for posts.

B. Section 08710 - Door Hardware: Gate locking device.

C. Section 02590 - Site Grounding.

1.03 PRICE AND PAYMENT PROCEDURES

A. Fencing: Measurement and payment by the linear foot, to the fence height specified, based on the specified post spacing. Includes posts, rails, tension wire, and, accessories.

B. Double Gates: Measurement and payment by each item. Includes frame posts, accessories, and hardware.

1.04 REFERENCE STANDARDS

A. ASTM A121 - Standard Specification for Metallic-Coated Carbon Steel Barbed Wire; 2013.

B. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2012.

C. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2009.

D. ASTM A392 - Standard Specification for Zinc-Coated Steel Chain-Link Fence Fabric; 2011a.

E. ASTM A428/A428M - Standard Test Method for Weight (Mass) of Coating on Aluminum-Coated Iron or Steel Articles; 2010.

F. ASTM A491 - Standard Specification for Aluminum-Coated Steel Chain-Link Fence Fabric; 2011.

G. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2011.

H. ASTM A1011/A1011M - Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength; 2012a

I. ASTM C94/C94M - Standard Specification for Ready-Mixed Concrete; 2013.

J. ASTM F569 - Standard Practice for Installation of Chain-Link Fence; 2011.

K. ASTM F569 – Cold rolled steel pipe for framework (SS40).

L. ASTM F1043 - Standard Specification for Strength and Protective Coatings on Steel Industrial Chain Link Fence Framework; 2011.

M. ASTM F1083 - Standard Specification for Pipe, Steel, Hot-Dipped Zinc-Coated (Galvanized) Welded, for Fence Structures; 2010.

N. CLFMI CLF 2445 - Product Manual; Chain Link Fence Manufacturers Institute; 1997.

1.05 SUBMITTALS

A. See Section 01300 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data on fabric, posts, accessories, fittings and hardware.

C. Shop Drawings: Indicate plan layout, spacing of components, post foundation dimensions, hardware anchorage, and schedule of components.

D. Manufacturer's Installation Instructions: Indicate installation requirements, post foundation anchor bolt templates.

E. Project Record Documents: Accurately record actual locations of property perimeter posts relative to property lines and easements.

1.06 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than three years of documented experience.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Chain Link Fences and Gates:
   1. Master-Halco, Inc.; www.fenceonline.com.
   2. Merchants Metals; www.merchantsmetals.com.
   4. Substitutions: See Section 01600 - Product Requirements.

2.02 MATERIALS AND COMPONENTS

A. Materials and Components: Conform to CLFMI Product Manual.

B. Fabric Size: CLFMI Heavy Industrial service.

C. Intermediate Posts: Type I round.

D. Terminal, Corner, Rail, Brace, and Gate Posts: Type I round.

E. Gates: Double gates, see plan for Pump Station detail.

2.03 MATERIALS

A. Posts, Rails, and Frames: ASTM A1011/A1011M, Designation SS40; hot-rolled steel strip, cold formed to pipe configuration, longitudinally welded construction, minimum yield strength of 50 ksi; zinc coating conforming to ASTM F1043 Type B on pipe exterior and interior.

B. Posts, Rails, and Frames: Formed from hot-dipped galvanized steel sheet, ASTM A653/A653M, HSLAS, Grade 50, with G90 (Z275) zinc coating.

C. Wire Fabric: ASTM A392 zinc coated steel chain link fabric.

D. Barbed Wire: Zinc-coated steel, complying with ASTM A121 Type Z Coating Class 1; 2 strands of 0.099 inch diameter wire, with 2-pointed barbs at 4 inches on center.

E. Barbed Wire: Aluminum-coated steel, complying with ASTM A121; 2 strands of 0.099 inch diameter wire, with 4-pointed barbs at 3 inches on centers.

F. Barbed Wire: PVC-coated steel, complying with ASTM F1665; 2 strands of 0.099 inch diameter wire, with 2-pointed barbs at 4 inches on center.

G. Barbed Tape: Stainless steel, 0.025 inch thick x 1 inch wide, coil diameter of 24 inch, die stamped to produce 4 barbed points at 4 inch on center; cold clench over stainless steel core.

H. Concrete: Type specified in Section 03300.

I. Concrete: Ready-mixed, complying with ASTM C94/C94M; normal Portland cement; 3,000 psi strength at 28 days, 3 inch slump; nominal size aggregate.

2.04 COMPONENTS

A. Line Posts: 1.9 inch diameter.

B. Corner and Terminal Posts: 2.38 inch.

C. Gate Posts: 3.5 inch diameter.

D. Top and Brace Rail: 1.66 inch diameter, plain end, sleeve coupled.

E. Gate Frame: 1.66 inch diameter for welded fabrication.

F. Fabric: 2 inch diamond mesh interwoven wire, 9 gage steel core wire with a fused and adhered vinyl coating for a total of 8 gage finish thickness , top selvage knuckle end closed, bottom selvage twisted tight to meet ASTM F668,class2B

G. Tension Wire: 6 gage thick steel, single strand.

H. Tension Band.

I. Tension Strap.

J. Tie Wire: Aluminum alloy steel wire.

2.05 ACCESSORIES

A. Caps: Cast steel galvanized; sized to post diameter, set screw retainer.

B. Fittings: Sleeves, bands, clips, rail ends, tension bars, fasteners and fittings; steel.

C. Extension Arms: Cast steel galvanized, to accommodate 3 strands of barbed wire, single arm, vertical.

D. Hardware for Single Swinging Gates: 180 degree hinges, 2 for gates up to 60 inches high, 3 for taller gates; fork latch with gravity drop and padlock hasp; keeper to hold gate in fully open position.

E. Hardware for Double Swinging Gates: 180 degree hinges, 2 for gates up to 60 inches high, 3 for taller gates; drop bolt on inactive leaf engaging socket stop set in concrete, active leaf latched to inactive leaf preventing raising of drop bolt, padlock hasp; keepers to hold gate in fully open position.

2.06 FINISHES

A. Components (Other than Fabric): Galvanized in accordance with ASTM A123/A123M, at 1.7 oz/sq ft.

B. Components (Other than Fabric): Aluminum coated at 0.40 oz/sq ft, when measured in accordance with ASTM A428/A428M.

C. Components and Fabric: Polyester powder coated over coating of 1.2 oz/sq ft zinc coating.

D. Hardware: Zinc coating with polyester powder coating by ASTM F626.

E. Accessories: Same finish as framing.

F. Color(s): To be selected by Engineer from manufacturer's standard range.

G. Color(s): Black.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install framework, fabric, accessories and gates in accordance with ASTM F567.

B. Place fabric on outside of posts and rails.

C. Set intermediate posts plumb, in concrete footings with top of footing 2 inches above finish grade. Slope top of concrete for water runoff.

D. Line Post Footing Depth Below Finish Grade: ASTM F567.

E. Corner, Gate and Terminal Post Footing Depth Below Finish Grade: ASTM F567.

F. Brace each gate and corner post to adjacent line post with horizontal center brace rail and diagonal truss rods. Install brace rail one bay from end and gate posts.

G. Provide top rail through line post tops and splice with 6 inch long rail sleeves.

H. Install center brace rail on corner gate leaves.

I. Do not stretch fabric until concrete foundation has cured 28 days.

J. Stretch fabric between terminal posts or at intervals of 100 feet maximum, whichever is less.

K. Position bottom of fabric 2 inches above finished grade.

L. Fasten fabric to top rail, line posts, braces, and bottom tension wire with tie wire at maximum 15 inches on centers.

M. Attach fabric to end, corner, and gate posts with tension bars and tension bar clips.

N. Install bottom tension wire stretched taut between terminal posts.

O. Install support arms sloped inward and attach barbed wire; tension and secure.

P. Do not attach the hinged side of gate to building wall; provide gate posts.

Q. Install gate with fabric and barbed wire overhang to match fence. Install hardware.

R. Provide concrete center drop to footing depth and drop rod retainers at center of double gate openings.

S. Ground fence in accordance with Section 02590.

T. Install gate locking device specified in Section 08710 - Door Hardware.

3.02 TOLERANCES

A. Maximum Variation From Plumb: 1/4 inch.

B. Maximum Offset From True Position: 1 inch.

C. Components shall not infringe adjacent property lines.

3.03 MEASUREMENT AND PAYMENT

A. The payment will be made at the unit price “linear foot” as stated in the Bid Form for Chain link Fences and Gates.

END OF SECTION

SECTION 32 91 19.13

TOPSOIL

PART 1 - GENERAL

1.1 DESCRIPTION

A. The Section includes providing all labor, materials, tools and equipment necessary for furnishing and placing topsoil at the locations shown on the Drawings.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Topsoil furnished by the CONTRACTOR shall consist of a natural friable surface soil without admixtures of undesirable subsoil, refuse, or foreign materials. It shall be reasonably free from roots, hard clay, coarse gravel, stones larger than one inch in any dimension, noxious weeds, tall grass, brush, sticks, stubble or other material which would be detrimental to the proper development of vegetative growth.

Topsoil shall be obtained from naturally well drained sites where topsoil occurs at least 4-inches deep. Topsoil shall not be obtained from bogs or marshes.

B. Topsoil shall conform to the following grading:

Sieve Sizes	Percentage Passing
1-inch	100%
1/2 inch	95% - 100%
No.4	75% - 100%
No.10	60% - 100%
No.200	10% - 60%

C. Topsoil shall contain not less than 3%, or more that 20% organic matter, by weight as determined by loss-on-ignition of oven-dried samples in accordance with ATM T-6. Organic material shall be decomposed and free of wood.

D. The ENGINEER shall be notified on the location from which the CONTRACTOR proposes to furnish topsoil at least 30 calendar days prior to delivery of topsoil to the Project from that location. The topsoil and its source will be inspected and tested by the ENGINEER before approval will be granted for its use.

E. Topsoil sources lacking organic matter may be used if, prior to delivery to the Project, sufficient organic matter in the form of pulverized peat moss or rich organic soil from other sources is thoroughly mixed with the topsoil to provide a product meeting the above requirements.

F. Organic material for incorporation into topsoil, if required, shall be partially decomposed fibrous or cellular stems and leaves of any of several species of Sphagnum mosses, or rotted manure. Organic material may require chopping to shredding to insure thorough mixing with the topsoil.

G. All topsoil shall be fertilized as follows: the application rates of the fertilizer and limestone per 1,000 square feet of ground area of topsoil furnished by the CONTRACTOR shall be determined by the ENGINEER, based on soil analysis tests so that the total natural and applied chemical constituents are as follows:

Nitrogen	1.0 lb. minimum - 1.5 lb. maximum per 1,000 square feet
Phosphoric Acid	1.0 lb. minimum - 2.0 lb. maximum per 1,000 square feet
Potassium	1.0 lb. minimum - 2.0 lb. maximum per 1,000 square feet
Limestone	Limestone requirements shall conform to the following table:

LIMESTONE REQUIREMENTS

Soil pH	Limestone Tons per Acre
Above 6.0	0
5.0 - 6.0	1.5
Below 5.0	3.0

PART 3 - EXECUTION

3.1 CONSTRUCTION

A. All areas beyond the sidewalk or roadway shoulder that are disturbed during construction which are not covered with pavement, concrete, or base course, shall be graded to a neat, uniform grade line and appearance, as determined by the ENGINEER, and covered with a neat uniform, three-inch minimum thickness of topsoil and hydroseeded, unless otherwise shown on the Drawings, or directed by the ENGINEER.

B. The topsoil shall be evenly spread on the designated areas to a depth, which, after settlement and compaction, shall be three inches, unless otherwise directed by the ENGINEER. Spreading shall not be done when the ground or topsoil is frozen, excessively wet, or otherwise in a condition detrimental to the WORK, as determined by the ENGINEER. Roadway surfaces shall be kept clean during hauling and spreading operations.

C. After spreading has been completed, large clods, stones larger than one-inch in any dimension, roots stumps, and other litter shall be raked up and removed.

D. The final grading of the topsoil prior to hydroseeding shall be to a tolerance that will not permit ponding of water in excess of one inch in depth.

E. Topsoil Finish Grading, if a pay item will not be approved for start-up until the topsoil has been graded to within the tolerances given above.

1. The CONTRACTOR shall provide labor personnel experienced with landscaping work that involves fine grading of topsoil for residential or commercial lawns.
2. The ENGINEER will determine the location of those areas requiring finish grading and the time required to bring the graded topsoil to the desirable finish appearance.
3. The CONTRACTOR shall remove and dispose of all excess materials resulting from the finish grading of the topsoil. The WORK required to remove and dispose of this excess material from piles placed along the roadway will be considered incidental to other WORK under the contract.

END OF SECTION

SECTION 32 92 00

TURF AND GRASSES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Seeding and Fertilization

B. Provide grassing for the area specified herein, or as indicated, for a complete and proper installation.

C. Water and sanitary sewer easements, including highway and street shoulders: All areas disturbed by the construction process.

1.02 RELATED REQUIREMENTS

A. Documents affecting work in this section include, but are not necessarily limited to, General Conditions, and Sections in Division 1 of these Specifications.

B. Section 31 23 23.13 – Backfill and Compaction

C. Section 31 25 00 – Erosion and Sediment Control

1.03 DEFINITIONS

A. Weeds: Include Dandelion, Jimsonweed, Quackgrass, Horsetail, Morning Glory, Rush Grass, Mustard, Lambsquarter, Chickweed, Cress, Crabgrass, Canadian Thistle, Nutgrass, Poison Oak, Blackberry, Tansy Ragwort, Johnsongrass, Poison Ivy, Nut Sedge, Nimble Will, Blindweed, Bentgrass, Wild Garlic, Perennial Sorrel, and Brome Grass.

1.04 QUALITY ASSURANCE

A. Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this Section.

B. Seed: Conform to all State laws and to all requirements and regulations of the South Carolina Department of Agriculture.

1. Deliver to site each variety of seed individually packaged and tagged to show name, net weight, origin, and lot number.

C. Fertilizer: Conform to State fertilizer law.

1.05 SUBMITTALS

A. See Section 01 30 00 – Administrative Requirements, for submittal procedures.

B. Comply with pertinent provisions of Section 01 30 00.

C. Product Data: Within 15 calendar days after the Contractor has received the Owner's Notice to Proceed, submit:

1. Complete materials list of items proposed to be provided under this Section.

2. Material Safety Data Sheets for all materials to be used.

3. Installation/Application Instructions for all relevant materials (i.e. erosion blankets, hydraulic mulches)

1.06 DELIVERY, STORAGE AND HANDLING

A. Deliver grass seed mixture in sealed containers. Seed in damaged packaging is not acceptable. Deliver seed mixture in containers showing percentage of seed mix, year of production, net weight, date of packaging, and location of packaging.

B. Deliver fertilizer in waterproof bags showing weight, chemical analysis, and name of manufacturer.

C. Comply with pertinent provisions of Section 01 60 00 – Product Requirements

D. At time of delivery, furnish the Engineer invoices of all materials received in order that application rates may be determined.

E. Immediately remove from the site materials that do not comply with the specified requirements, and promptly replace with materials meeting the specified requirements.

PART 2 PRODUCTS

2.01 GRASS SEED

A. Provide grass seed that is:

1. Free from noxious weed seeds

2. Current year crop seed

3. Treated with appropriate fungicide at time of mixing

4. Delivered to the site in sealed containers with dealer's guaranteed analysis

B. Water: Clean, fresh and fee of substances that could inhibit vigorous growth of grass.

C. Stakes: Softwood lumber, chisel pointed

D. String: inorganic fiber

E. Lime and pH Adjustment

1. For Dry Seeding operations provide agricultural grade, standard ground limestone conforming to the current "Rules, Regulations and Standards of the Fertilizer Board of Control" issued at Clemson University.

2. For Hydraulic Seeding operations, provide NeutraLime® Dry by Profile Products to raise pH or Aqua-pHix® by Profile Products to lower pH at rate determined by soil analysis or at manufacturer's recommended rate.

3. Bag tags or delivery slip for bulk loads shall indicate brand or trade name, calcium carbonate equivalent, and other pertinent data to identify the lime.

F. Wood Fiber Mulch

1. Provide 100% thermally processed wood fiber or blended 70/30 wood/cellulose fiber manufactured specifically for discharging uniformly on the ground surface when dispersed by a hydro-seeding machine.

2. Material shall contain thermally processed wood fibers so as to contain no germination or growth inhibiting factors and to achieve phyto-sanitization.

3. Material shall contain basic green dye to facilitate visual metering.

G. Flexterra HP-FGM

1. Provide Flexterra HP-FGM® as manufactured by Profile Products.

2. Material shall contain thermally refined wood fibers and crimped synthetic fibers so as to contain no germination or growth inhibiting factors.

3. Materials shall contain non-toxic green dye to facilitate metering.

4. Material shall be 100% Bio-degradable.

H. Straw Mulch/Dry Applied Mulching Pellets

1. Provide straw or hay material.

a. Straw to be stalks of wheat, rye, barley or oats.

b. Hay to be timothy, peavine, alfalfa or coastal Bermuda

2. Material to be reasonably dry and reasonably free from mature seed bearing stalks, roots, or bulblets or Johnson Grass, Nutgrass, Wild Onion or any other Noxious weeds detailed in part 1.04 of this Section.

3. Seed Aide Aero® manufactured by Profile Products at a rate of 3,000 LBS/ACRE can be used as a weed free alternative to straw mulch.

I. Erosion Control Blanket

1. Provide on areas as shown on the plans

2. Provide Erosion Control Blanket S-2®, from Western Excelsior, or approved equal.

2.02 TESTS

A. Provide analysis of topsoil fill under provisions of Section 01 40 00 – Quality Requirements

B. Analyze to ascertain the percentage of nitrogen, phosphorus, potash, soluble salt content, organic matter, and pH value.

C. Submit minimum 10 oz (280 g) sample of topsoil proposed. Forward sample to approved testing laboratory in sealed containers to prevent contamination.

D. Testing is not required if recent test are available for imported topsoil. Submit these test results to the testing laboratory for approval. Indicate, by test results, information necessary to determine suitability.

E. If pH is not in the range of 6.0 to 7.0, adjust accordingly with Lime.

F. Organic matter must be 2.0% or greater. If organic matter percentage is less than 2%, contractor shall apply JumpStart® and/or BioPrime® by Profile Products to modify soil organic matter. JumpStart and BioPrime to be applied at rate determined by soil analysis or at manufacturer's recommended rate

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that prepared soil base is ready to receive the work of this Section.

3.02 PREPARATION

A. Seed these areas immediately upon completion of grading or construction and cleanup operations.

1. Slopes greater than 4:1

2. Utility right-of-ways or any other disturbed area adjacent to wetlands.

B. Bring all areas to proper line, grade and cross section indicated on the plans.

C. Repair erosion damage prior to commencing seeding operations.

D. Loosen seed bed to a minimum depth of 3" and track in slope so as the direction of the track marks is perpendicular to the direction of the slope.

E. Ensure a minimum of 2-inches of topsoil exists in areas to be seeded.

F. Remove all roots, clods, stones larger than 1" in any dimension, and other debris.

3.03 FERTILIZATION

A. Apply fertilizer in accordance with manufacturer's instructions, and the Soil Analyses as detailed in part 2.03 of this Section.

B. Apply after smooth raking of topsoil and prior to roller compaction.

C. Mix thoroughly into upper 2 inches (50 mm) of topsoil.

D. If seeding using a hydro-seeder apply fertilizer in slurry with mulch, seed, and lime.

E. Spread uniformly over areas to be seeded at:

1. Rate of 11 LBS/1000 sq. ft. when using 19-19-19.

2. Rate of 20 LBS/1000 sq. ft. when using 10-10-10.

3. Use approved mechanical spreaders for dry seeding application.

F. Second Application of Fertilizer

1. When plants are established and showing satisfactory growth, apply Nitrogen at the rate of 1 lb. per 1000 sq. ft.

2. Apply using dry seeding application unless otherwise directed by Engineer.

3. Do not apply to stands of temporary grasses.

3.04 SEEDING

A. Mixtures of different types of seed for the various schedules shall be weighted and mixed in proper proportions in the presence of the Engineer.

B. Permanent Seeding Mix – Slopes 4:1 or Greater

1. Schedule No. 1 – Planting Dates April 1 – September 15:

a. Slopemaster® Spring/Summer Mix by Pennington Seed, Inc.
25% Hulled Sahara Bermudagrass
25% Unhulled Sahara Bermudagrass
25% Pensacola Bahiagrass
10% Durana White Clover
10% Brown Top Millet
5% Weeping Lovegrass

b. Rate 75 LBS/ACRE or 1.75 LBS/1000 sq. ft.

c. Seed to be coated with MYCO Advantage by Pennington Seed, Inc.

d. Contact: Pennington Seed, Inc., 1236 Eden Street, Columbia, SC 29201 – Jay Sprague – 803-608-5963

2. Schedule No. 2 – Planting Dates September 15 – March 31:

a. Slopemaster Fall/Winter Mix by Pennington Seed, Inc.
25% Unhulled Sericea Lespedeza
20% Unhulled Sahara Bermudagrass
20% Greystone Tall Fescue
10% Pensacola Bahiagrass
10% Durana White Clover
10% Rye Grain
5% Weeping Lovegrass

b. Rate 100 LBS/ACRE or 2.25 LBS/1000 sq. ft.

c. Seed to be coated with MYCO Advantage by Pennington Seed, Inc.

d. Contact: Pennington Seed, Inc., 1236 Eden Street, Columbia, SC 29201 – Jay Sprague – 803-608-5963

C. Permanent Seeding Mix – Slopes 4:1 or Less

1. Schedule No. 1 – Planting Dates April 1 – September 15:

a. Hulled Sahara® Bermudagrass

b. Rate 75 LBS/ACRE or 1.75 LBS/1000 sq. ft.

2. Schedule No. 2 – Planting Dates September 15 – March 31:

a. Unhulled Sahara Bermudagrass

b. Rate 100 LBS/ACRE or 2.25 LBS/1000 sq. ft.

D. Temporary Seeding Mix – All Disturbed Areas

1. Schedule No. 1 – Planting Dates April 1 – September 15:

a. Brown Top Millet

Rate 45 LBS/ACRE or 1 LBS/1000 sq. ft.

2. Schedule No. 2 – Planting Dates September 15 – March 31:

a. Rye Grain

Rate 80 LBS/ACRE or 2 LBS/1000 sq. ft.

E. Do not seed areas in excess of that which can be mulched on same day.

F. Do not sow during rain, when the ground is too dry, or during windy periods.

G. Immediately following seeding and compacting, apply mulch to a thickness of 1/8 inches (3 mm). Maintain clear of shrubs and trees.

H. Apply water with a fine spray immediately after each area has been mulched. Saturate to 4 inches (100 mm) of soil.

I. Following germination, immediately re-seed areas without germinated seeds that are larger than 4 by 4 inches (100 mm by 100mm).

3.05 SOWING METHODS

A. General:

1. Perform seeding during the periods and at the rates specified in the seeding schedules.

2. Do not conduct seeding work when ground is frozen or excessively wet.

3. Produce satisfactory stand of grass regardless of period of the year the Work is performed.

B. Seeding, slopes less than four horizontal to one vertical:

1. Seeding of slopes of 4:1 or less will be done in one of the following two ways:

2. Dry Seeding:

a. Sow seed not more than 24 hours after application of fertilizer and lime.

b. Use mechanical seed drills on accessible areas, rotary hand seeders, power sprayers, etc. may be used on steep slopes or areas not accessible to seed drills.

c. Cover seed and lightly compact with culti-packer if seed drill does not.

d. Within 24 hours following compaction of seeded areas, uniformly apply straw mulch, as defined in Section 2.01, at a rate of 4000 LBS/ACRE or 90 LBS/1000 sq. ft.

3. Hydraulic Seeding:

a. Apply seed, fertilizer, lime, and wood fiber mulch using hydraulic equipment.

b. Equipment to have built-in agitation system with capacity to agitate, suspend and homogeneously mix a slurry of the specified amount of fiber, fertilizer, seed, lime, and water.

c. Minimum capacity of slurry tank: 1000 gallons.

d. Apply 100% wood or 70/30 wood/cellulose blend fiber mulch, defined in Section 2.01, at a rate of 2500 LBS/ACRE or 60 LBS/1000 sq. ft.

e. Regulate slurry mixture so that amounts and rates of application will result in uniform application of all materials at not less than the specified amounts.

f. Apply slurry in two directions so as to avoid “shadowing.”

g. Use color of fiber mulch as guide, spraying the prepared seed bed until a uniform visible coat is obtained.

C. Seeding, slopes greater than four horizontal to one vertical:

1. Seeding of slopes of 4:1 or greater will be done in one of the following two ways

2. Dry Seeding:

a. Sow seed not more than 24 hours after application of fertilizer and lime.

b. Use mechanical seed drills on accessible areas, rotary hand seeders, power sprayers, etc. may be used on steep slopes or areas not accessible to seed drills.

c. Cover seed and lightly compact with culti-packer if seed drill does not.

d. Within 24 hours following compaction of seeded areas, uniformly lay double netted excelsior blanket, as defined in Section 2.01, over seeded areas. Excelsior blanket installation and staple pattern shall conform strictly to manufacturer’s instructions.

3. Hydraulic Seeding:

a. Apply seed, fertilizer, lime, and Flexterra HP-FGM mulch using hydraulic equipment.

b. Equipment to have built-in agitation system with capacity to agitate, suspend and homogeneously mix a slurry of the specified amount of fiber, fertilizer, seed, lime, and water.

c. Minimum capacity of slurry tank: 1000 gallons.

d. Apply Flexterra HP FGM, as defined in Section 2.01, at a rate of 3000 LBS/ACRE or 68 LBS/1000 sq. ft.

e. Regulate slurry mixture so that amounts and rates of application will result in uniform application of all materials at not less than the specified amounts.

f. Apply slurry in two directions so as to avoid “shadowing.”

g. Use color of fiber mulch as guide, spraying the prepared seed bed until a uniform visible coat is obtained.

3.06 MAINTENANCE

A. Water to prevent grass and soil from drying out.

B. Roll surface to remove minor depressions or irregularities.

C. Control growth of weeds. Apply herbicides in accordance with manufacturer’s instructions.

D. Remedy damage resulting from improper use of herbicides.

E. Areas not showing satisfactory evidence of germination within six weeks of the seeding or which show bare spots, shall be immediately reseeded, fertilized and/or mulched.

F. Protect seeded areas with warning signs during maintenance period.

G. Maintain all seeded areas in satisfactory condition until final acceptance of Work.

H. Repair any eroded areas.

I. Mow as necessary to maintain healthy growth rate until final acceptance of the Work.

3.07 ACCEPTANCE

A. Permanently seeded areas will be accepted when the stand of grass reaches 70% coverage.

B. No acceptance will be made of temporary seeded areas.

3.08 MEASUREMENT AND PAYMENT

A. No separate measurement or direct payment will be made for the work under this Section and all costs for same shall be included in the price bid for the item to which it pertains.

END OF SECTION

SECTION 33 32 19

WASTEWATER PUMP STATION

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Work under this section includes, but is not limited to, furnishing and installing a duplex submersible pump station as indicated on the project drawings, herein specified, as necessary for proper and complete performance.

1.02 REFERENCES

A. Publications listed below form part of this specification to extent referenced in the text by basic designation only. Consult latest edition of publication unless otherwise noted.

1. American National Std. Institute (ANSI) / American Water Works Assoc. (AWWA)
    a. ANSI B16.1 Cast iron pipe flanges and flanged fittings.
    b. ANSI/AWWA C115/A21.51 Cast/ductile iron pipe with threaded flanges.
    c. ANSI 253.1 Safety Color Code for Marking Physical Hazards.
    d. ANSI B40.1 Gages, Pressure and Vacuum.
    e. AWWA C508 Single Swing Check Valves.
2. American Society for Testing and Materials (ASTM)
    a. ASTM A48 Gray Iron Castings.
    b. ASTM A126 Valves, Flanges, and Pipe Fittings.
    c. ASTM A307 Carbon Steel Bolts and Studs.
    d. ASTM A36 Structural Steel.
3. Institute of Electrical and Electronics Engineers (IEEE)
    a. ANSI/IEEE Std 100 Standard Dictionary of Electrical Terms.
    b. ANSI/IEEE Std 112 Test Procedure for Polyphase Induction Motors.
    c. IEEE Std 242 Protection of Industrial and Control Power Systems.
4. National Electric Code (NEC) / National Electrical Manufacturers Assoc. (NEMA)
    a. NEC National Electric Code.
    b. NEC 701 National Electric Code article 701.
    c. NEMA Std MG1 Motors and Generators.
5. Miscellaneous References
    a. Ten-State Standards Recommended Standards for Sewage Works.

b. Hydraulic Institute Std for Centrifugal, Rotary and Reciprocating Pumps.

c. NMTBA and JIC Std. National Machine Tool Builders Association and Joint Industrial Council Standards

d. ISO 9001International Organization for Standardization.

1.03 SUBMITTALS

A. Product Data

1. Prior to fabrication, pump station manufacturer shall submit six (6) copies of submittal data for review and approval.

2. Submittal shall include shop drawings, electrical ladder logic drawings, and support data as follows: Catalog cuts sheets reflecting characteristics for major items of equipment, materials of construction, major dimensions, motor and shaft drive data, pump characteristic curves showing the design duty point capacity (GPM), head (FT), and hydraulic brake horsepower (BHP). Electrical components used in the motor branch and liquid level control shall be fully described.

B. Shop drawings shall provide layout of mechanical equipment and anchor bolt locations for equipment base plate. The electrical ladder logic drawings shall illustrate motor branch and liquid level control circuits to extent necessary to validate function and integration of circuits to form a complete working system.

C. Operations Maintenance Manuals

1. Installation shall be in accordance with written instructions provided by the pump station manufacturer. Comprehensive instructions supplied at time of shipment shall enable personnel to properly operate and maintain all equipment supplied. Content and instructions shall assume operating personnel are familiar with pumps, motors, piping and valves, but lack experience on exact equipment supplied.

2. Documentation shall be specific to the pump station supplied and collated in functional sections. Each section shall combine to form a complete system manual covering all aspects of equipment supplied by the station manufacturer. Support data for any equipment supplied by others, even if mounted or included in overall station design, shall be provided by those supplying the equipment. Instructions shall include the following as a minimum:

a. Functional description of each major component, complete with operating instructions.

b. Instructions for operating pumps and pump controls in all modes of operation.

c. Calibration and adjustment of equipment for initial start-up, replacement of level control components, or as required for routine maintenance.

d. Support data for commercially available components not produced by the station manufacturer, but supplied in accordance with the specifications, shall be supported by literature from the prime manufacturer and incorporated as appendices.

e. Electrical schematic diagram of the pump station circuits shall be in accordance with NFPA70. Schematics shall illustrate, to the extent of

authorized repair, pump motor branch, control and alarm system circuits including interconnections. Wire numbers and legend symbols shall be shown. Schematic diagrams for individual components, not normally repairable by the station operator, need not be included. Details for such parts shall not be substituted for an overall system schematic. Partial schematics, block diagrams, and simplified schematics shall not be provided in lieu of an overall system diagram.

f. Mechanical layout drawing of the pump station and components, prepared in accordance with good commercial practice, shall provide installation dimensions and location of all pumps, motors, valves and piping.

3. Operation and maintenance instructions which rely on vendor cut-sheets and literature which include general configurations, or require operating personnel to selectively read portions of the manual shall not be acceptable. Operation and maintenance instructions must be specific to equipment supplied in accordance with these specifications.

1.04 QUALITY ASSURANCE

A. The pump manufacturer must be ISO 9001:2000 revision certified, with scope of registration including design control and service after sales activities.

B. All internal passages, impeller vanes, and recirculation ports shall pass a three (3) inch 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.

C. Components including the pumps, motors, and controls will be tested as a complete working system at the manufacturer's facility. Tests shall be conducted in accordance with Hydraulic Institute Standards at the specified head, capacity, rated speed and horsepower. Factory operational test shall duplicate actual performance anticipated for the complete pumps.

D. The manufacturer’s technical representative shall inspect the completed installation, correct or supervise the correction of any defect or malfunction, and instruct operating personnel in the proper operation and maintenance of the equipment as described in Part 3 of this section.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Deliver equipment in manufacturer’s packaging and store per manufacturer’s instructions.

1.06 PROJECT/SITE CONDITIONS

A. These pumps will be installed in a new, circular concrete wet well as shown on the drawings.

1.07 MANUFACTURER'S WARRANTY

A. The pump manufacturer shall warrant all equipment to be of quality construction, free of defects in material and workmanship. Pumps and other equipment, apparatus, and parts furnished by the pump manufacturer shall be warranted for five years or 10,000 hours of normal use, operation and service. The warranty shall be in printed form and apply to all similar units.

B. 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.

PART 2 - PRODUCTS

2.01 SYSTEM DESCRIPTION

A. Contractor shall furnish and install submersible duplex pump station including pre-cast concrete wetwell and valve vaults per the construction drawings. The wastewater pump station shall include all necessary ductile iron piping, fitting, valves, and appurtenances. The installed system station includes two (2) submersible wastewater pumps, float control system, pump control panel including soft starters, electrical power feed per riser diagram, and necessary conduit, wiring, etc. as detailed on the construction drawings.

B. Wet well

1. The wet well shall be precast reinforced concrete sections conforming to ASTM C-478 or cast-in-place Portland cement conforming to ASTM C150, type II 4,000 psi and absorption shall not exceed 6%. Additional information is detailed within Division 3 of these specifications. The footing shall be concrete placed on a dry, compacted subgrade. The footing shall be designed to prevent flotation of the empty wet-well structure. The wetwell shall be constructed to the dimensions shown on the drawings. The access hatch in the top slab of the wet well shall have a minimum 48" x 30" (inch) clear opening, with a live load capacity of 300 pounds per square foot. The frame shall be complete with hinged and hasp-equipped cover, upper guide holders, chain holders and stainless steel cable holder. Frame shall be securely mounted directly above the pumps. The door shall be torsion bar loaded for ease of lifting and shall have safety locking handle in open position. Fastening hardware used inside the wet well shall be stainless steel. Depth of wetwell shall not exceed 28 feet below existing grade.

2. The concrete mix design shall include a XyPex or approved equal admixture for waterproofing the wetwell from exterior groundwater present. All wet-well sections shall be jointed with “Ram-Nek” joint sealer, or approved equivalent, with primer. The primer shall be applied to all contact surfaces of the concrete wall joint as recommended by the manufacturer.

3. The Contractor shall furnish and install guide rails for each pump, to permit the raising and lowering of the pump. Guide bars shall be 316 stainless steel and of adequate length and strength to extend from the lower guide holders on the pump discharge connection to the upper guide holder mounted on the access frame. Guide rails shall be installed plumb with stainless steel intermediate supports as required by the Engineer.

4. All conduit entering pump station should be sealed air tight at the wet well and at the control panel. Once above grade, these conduits shall also have an air gap immediately below the control panel. Conduit shall be sealed air tight on either side of the air gap.

5. The interior of wet well and valve vault shall be coated with protective coating detailed within Section 09 90 23.12 – Epoxy Lining for wetwell and manhole interiors.

6. All piping and fittings within a wet well from the pump base to the valve pit shall have an epoxy prime exterior.

7. All exposited metal piping and fittings shall receive TNEMEC, or approved equal, protective coatings with a minimum of 4.0 to 6.0 mils of Series 1028 coating system. The finish coat shall be resistant to oil mist exposure, solvent contact, and salt spray. The factory finish shall allow for over-coating and touch up after final installation.

C. Valve Vault

1. Valve Pit shall be precast reinforced concrete sections conforming this to ASTM C-478 or cast-in-place Portland cement conforming to ASTM C150, type II 4,000 psi and absorption shall not exceed 6%. Additional information is detailed within Division 3 of these specifications. The footing shall be concrete placed on a dry, compacted sub grade. The footing shall be designed to prevent flotation of the empty wet-well structure. The valve vaults shall be constructed to the dimensions shown on the drawings. The access hatch in the top slab of the valve vault shall have a minimum 36" x 36" (inch) clear opening, with a live load capacity of 300 pounds per square foot. The hatch shall include 1/4" (inch) tread plate, flush type lock with inside spoon handle. The frame shall be complete with hinged and hasp-equipped cover, upper guide holders, chain holders and stainless steel cable holder. Frame shall be securely mounted directly above the valves. The door shall be torsion bar loaded for ease of lifting and shall have safety locking handle in open position. Fastening hardware used inside the valve pit shall be stainless steel.

2. The concrete mix design shall include a XyPex or approved equal admixture for waterproofing the wetwell from exterior groundwater present. All wet-well sections shall be jointed with “Ram-Nek” joint sealer, or approved equivalent, with primer. The primer shall be applied to all contact surfaces of the concrete wall joint as recommended by the manufacturer.

3. The interior of wet well and valve vault shall be coated with protective coating detailed within Section 09 90 00 – Painting and Coating.

4. All piping and fittings within a wet well from the pump base to the valve pit shall have an epoxy prime exterior.

5. All exposited metal piping and fittings shall receive TNEMEC, or approved equal, protective coatings with a minimum of 4.0 to 6.0 mils of Series 1028 coating system. The finish coat shall be resistant to oil mist exposure, solvent contact, and salt spray. The factory finish shall allow for over-coating and touch up after final installation.

6. Drains from the valve pits shall discharge back to the wet well and include drain line flapping valve.

D. Plug Valves

1. All plug valves shall be of the non-lubricated, eccentric type conforming to AWWA C517 with resilient faced plugs, and Class 125 ANSI flanges. Valves to 20” size shall be round port or have a port area equivalent to 100% of full pipe area and all valves 24” and larger shall be 100% port area. Valve body and bonnet shall be made from ASTM A536 Grade 65-45-12 ductile iron or ASTM A126 Class B cast iron, internally and externally coated with 6-mil epoxy. Valve seats shall have a welded-in overlay of high nickel content on all surfaces contacting the plug face. Valves shall have permanently lubricated, stainless steel bearings in the upper and lower plug stem journals. All valves shall have bolted bonnets and adjustable compression packing or self-adjusting U-cup packing that can be replaced without removing the bonnet. All exposed nuts, bolts, springs, and washers shall be zinc plated. O-ring seals are not acceptable.

2. All valves larger than eight (8) inches shall be equipped with a gear actuator with handwheel. All gearing shall be enclosed in a semi-steel housing and be suitable for running in a lubricant, with seals provided on all shafts to prevent entry of dirt and water into the actuator. The actuator shaft and quadrant shall be supported on permanently lubricated bronze bearings. Actuators shall clearly indicate valve position and an adjustable stop shall be provided to set closing torque. All exposed nuts, bolts, and washers shall be zinc plated.

E. Check Valves

1. Check vales shall be of cushioned swing type and shall meet the materials requirements of AWWA specification C508. The valve shall be cast iron body, bronze mounted, single gate for non-shock working pressure of 175 psi. The valve shall be so constructed that by simply unbolting and lifting off the cover, the internal working parts may easily be removed and replaced without removing the valve from the line. The valve shall be furnished with outside lever and spring with non-corrosive adjustable air cushioned shock chamber. Check valves shall be suitable for mounting in horizontal lines or vertical lines when water flow is up. Check valves shall have a stainless steel hinge pin. Hinge pin shall operate in bronze support bearings. Check valves should close without any hammering action.

F. Pressure Gauge

1. Pressure gauge shall be 0 to 100 psi unless otherwise indicated on the drawings. Gauge accuracy shall be within 0.5% of the total scale range. Provide diaphragm isolators on all gauges so that their materials of construction are resistant to wastewater. Pressure shall be transmitted to the gauge by a locked in and sealed fluid such as ethylene glycol or silicone oil. Elastomer shall be Butyl or Neoprene. The pressure gauge shall be equivalent to Series 40 as manufactured by Red Valve Co. The pressure gauge will be installed in the valve pit upstream of the plug valves. The installation shall include a 3/4" (inch) tap with a stainless steel nipple and ball valve for isolation. The ball valve shall be stainless steel.

2.02 PUMP DESCRIPTION

A. The pumps and accessories shall be supplied by the pump manufacturer.

B. Equipment acceptance shall be contingent upon the pumps ability to run continuously at full speed for periods up to twenty-four hours. A demonstration may be required by the engineer.

C. The pump offered shall be the manufacturer's standard production model.

2.03 Design Requirements

A. Design: The pumps shall operate within this range without being power limited.

Pump #	1 & 2
Design Duty Point	175 GPM at 150' TDH
Impeller Diameter	7.3"
Number of Vanes for Impeller	1
Min. Sphere Solids Size	3"
Discharge Size	4"
Nominal HP	25
Operating Speed (Max.)	3547 RPM
Motor Frequency	60 Hz

2.04 PUMP DESIGN

A. The heavy duty submersible wastewater pumps shall be capable of handling raw unscreened sewage, storm water, and other similar solids-laden fluids without clogging. The pump shall be driven by a Premium Efficiency motor, providing the highest levels of operational reliability and energy efficiency.

2.05 GUIDE RAIL BASE ASSEMBLY

A. There shall be no need for personnel to enter the wet well to remove or reinstall the pumps. In a wet pit installation, the discharge base & elbow assembly shall be permanently installed in the wet well and connected to the discharge piping. In order to prevent binding or separation of the pump from the guide rail system, the pumps shall connect to the guide rail base automatically and firmly, guided by one 2-inch guide pipe (two 2-inch pipes optional) extending from the base elbow to the top of the station. Systems using guide cable in lieu of rigid guide bars or pipes shall not be considered acceptable. The sliding guide bracket shall be a separate part of the pumping unit, capable of being attached to standard 4 inch ANSI class 125 or metric DN100 pump flanges, so that the pump mounting is non-proprietary, and any pump with a standard discharge flange can be mounted on the base assembly. Base or bracket assemblies with proprietary or non-standard flange dimensions shall not be considered acceptable.

B. A field replaceable Nitrile (Buna-N) rubber profile gasket or o-ring shall accomplish positive sealing of the pump flange/guide rail bracket to the discharge elbow. Base assemblies which rely solely on metal to metal contact between the pump flange and discharge base elbow as a means of sealing are inherently leak prone, and shall not be considered equal. No portion of the pump shall bear directly on the floor of the sump. The guide rail system shall be available in an optional non-sparking version.

2.06 PUMP CONSTRUCTION

A. Major pump components shall be of gray cast iron, ASTM A-48, Class 35B with smooth surfaces devoid of porosity or other irregularities. All exposed fasteners shall be stainless steel 1.4401 (AISI type 316) construction. All metal surfaces coming into contact with the pumped media (other than the stainless steel components) shall be protected by a factory applied spray coating of high solids two part epoxy paint finish on the exterior of the pump. The pump shall be equipped with an open lifting hoop suitable for attachment of standard chain fittings, or for hooking from the wet well surface. The hoop shall ductile cast iron ASTM A536; 60-40-18, and shall be rated to lift a minimum of four times the pump weight.

B. Sealing design for the pump/motor assembly shall incorporate machined surfaces fitted with Nitrile (Buna-N) rubber O-rings. Sealing will be the result of controlled compression of rubber O-rings in two planes of the sealing interface. Housing interfaces shall meet with metal to metal contact between machined surfaces, and sealing shall be accomplished without requiring a specific torque on the securing fasteners. Rectangular cross sectioned gaskets requiring specific torque limits to achieve compression shall not be considered equal. No secondary sealing compounds shall be required or used.

2.07 IMPELLER

A. The impeller shall be of gray cast iron, EN-GJL-250 (ASTM A-48, Class 35B). The impeller shall be of the semi-open, non-clogging, single vane design, meeting the Ten-State Standards requirement for minimum solids passage size of 3 inches. The impeller shall be capable of passing a minimum of 3.1 inch diameter spherical solids as are commonly found in wastewater. The impeller shall have a slip fit onto the motor shaft and drive key, and shall be securely fastened to the shaft by a stainless steel bolt which is mechanically prevented from loosening by a positively engaged ratcheting washer assembly. The head of the impeller bolt shall be effectively recessed within the impeller bore or supporting washer to prevent disruption of the flow stream and loss of hydraulic efficiency. The impeller shall be dynamically balanced to the ISO 10816 standard to provide smooth vibration free operation.

Impeller designs which do not meet the Ten State Standards requirement for 3 inch solids passage size, those that rely on retractable impeller designs to pass 3 inch solids, or those that rely on fins or pins protruding into the suction path to assist in the handling of fibrous material shall not be considered equal.

2.08 WEAR PLATE

A. The wear plate shall be constructed from gray cast iron, ASTM A-48, Class 35B. The wear plate shall be designed with an inlet incorporating strategically placed cutting grooves and an outward spiral V-shaped groove on the side facing the impeller, to shred and force stringy solids outward from the impeller and through the pump discharge. The wear plate shall be mounted to the volute with four stainless steel securing screws and four stainless steel adjusting screws to permit close tolerance adjustment between the wear plate and impeller for maximum pump efficiency. Adjustment to allow for wear and restore peak pumping performance shall be easily accomplished using standard tools, and without requiring disassembly of the pump. The use of fixed or non-adjustable wear plates or rings, or systems that require disassembly of the pump or shimming of the impeller to facilitate adjustment shall not be considered equal or acceptable. The suction flange shall be integrated into the wear plate and its bolt holes shall be drilled and threaded to accept standard 6 inch ANSI class 125 flanged fittings.

2.09 PUMP VOLUTE

A. The pump volute shall be single piece gray cast iron, ASTM A-48, Class 35B non-concentric design with centerline discharge. Passages shall be smooth and large enough to pass any solids which may enter the impeller. Discharge size shall be as specified on the pump performance curve. The discharge flange design shall permit attachment to standard ANSI or metric flanges/appurtenances. The discharge flange shall be drilled to accept both 4 inch ANSI class 125 and metric DN100 (PN 10) metric flanged fittings. Proprietary or non-standard flange dimensions shall not be considered acceptable. The minimum working pressure of the volute and pump assembly shall be 16 bar (262 psi).

2.10 PREMIUM EFFICIENCY MOTOR

A. The Premium Efficiency motor shall meet efficiency standards in accordance with IEC 60034-30, level IE3 and NEMA Premium. Motor rating tests shall be conducted in accordance with IEC 60034-2-1 requirements and shall be certified accurate and correct by a third party certifying agency. A certificate shall be available upon request of owner or engineer.

B. The Premium Efficiency motor shall be housed in a water tight gray cast iron, ASTM A-48, Class 35B enclosure capable of continuous submerged operation underwater to a depth of 20 meters (65 feet), and shall have an IP68 protection rating. The motor shall be of the squirrel-cage induction design, NEMA type B, Premium Efficiency. The copper stator windings shall be insulated with moisture resistant Class H insulation material, rated for 180^{o}C (356^{o}F). The stator shall be press fitted into the stator housing. The use of bolts, pins or other fastening devices requiring penetration of the stator housing is unacceptable. The rotor bars and short circuit rings shall be made of cast aluminum.

C. The motor shall be designed for continuous duty. The maximum continuous temperature of the pumped liquid shall be 40^{o}C (104^{o}F), and intermittently up to 50^{o}C (122^{o}F). The motor shall be capable of handling up to 15 evenly spaced starts per hour without overheating. The service factor (as defined by the NEMA MG1 standard) shall be 1.3. The motor shall have a voltage tolerance of +/- 10% from nominal, and a phase to phase voltage imbalance tolerance of 1%. The motor shall have a NEMA Class. The surface temperature rating shall be T3C.

D. The motor shall be capable of operating, completely submerged, partially submerged, or unsubmerged. For submerged (wet pit) applications, the motor shall be self-cooling via the process fluid surrounding the motor.

E. Each phase of the motor shall contain a normally closed bi-metallic temperature monitor switch imbedded in the motor windings. These thermal switches shall be connected in series and set to open at 140°C +/- 5°C (284°F). They shall be connected to the control panel to provide a high stator temperature shutdown signal, and are used in conjunction with external motor overload protection. As an option, bi-metallic temperature switches shall be available for the upper and lower bearings to provide high bearing temperature warning signals.

2.11 MECHANICAL SEALS

A. Each pump shall be equipped with a triple seal system consisting of tandem mechanical shaft seals, plus a radial lip seal; providing three complete levels of sealing between the pump wet end and the motor. The mechanical seal system shall consist of two totally independent seal assemblies operating in a lubricant reservoir that hydro-dynamically lubricates the lapped seal faces at a constant rate. The mechanical seals shall be of non-proprietary design, and shall be manufactured by a major independent manufacturer specializing in the design and manufacture of mechanical seals. The lower, primary seal unit, located between the pump and the lubricant chamber, shall contain one stationary industrial duty solid silicon-carbide seal ring and one rotating industrial duty solid silicon-carbide seal ring. The stationary ring of the primary seal shall be installed in a seal holding plate of gray cast iron ASTM A-48, Class 35B. The seal holding plate shall be equipped with swirl disruption ribs to prevent abrasive material from prematurely wearing the seal plate. The upper, secondary seal unit, located between the lubricant chamber and the sensing chamber, shall contain one stationary industrial duty solid silicon-carbide seal ring, and one rotating one rotating industrial duty solid silicon-carbide seal ring. Each seal interface shall be held in contact by its own spring system. A radial lip seal shall be positioned above the sensing chamber, preventing any liquid which accumulates in the sensing chamber from entering the lower bearing and motor.

B. The seals shall not require routine maintenance, or adjustment, and shall not be dependent on the direction of rotation for proper sealing. Each pump shall be provided with a lubricant chamber for the shaft sealing system which shall provide superior heat transfer and maximum seal cooling. The lubricant chamber shall be designed to prevent overfilling, and to provide lubricant expansion capacity. The drain and inspection plug shall have a positive anti-leak seal, and shall be easily accessible from the outside of the pump. The seal system shall not rely upon the pumped media for lubrication and shall not be damaged when the pump is run dry. Lubricant in the chamber shall be environmentally safe non-toxic material.

2.12 MECHANICAL SEAL PROTECTION SYSTEM

A. The primary mechanical seal shall be protected from interference by particles in the wastewater, including fibrous materials, by an active Seal Protection System integrated into the impeller. The back side of the impeller shall be equipped with a sinusoidal cutting ring, forming a close clearance cutting system with the lower submersible motor housing or seal plate. This sinusoidal cutting ring shall spin with the pump impeller providing a minimum of 75 shearing actions per pump revolution. Large particles or fibrous material which attempt to lodge behind the impeller or wrap around the mechanical seal, shall be effectively sheared by the active cutting system into particles small enough the prevent interference with the mechanical seal. The Seal Protection System shall operate whenever the pump operates, and shall not require adjustment or maintenance in order to function. Submersible pump designs which do not incorporate an active cutting system to protect the primary mechanical seal shall not be considered acceptable for wastewater service.

B. The integrity of the mechanical seal system shall be continuously monitored during pump operation and standby time. An electrical probe shall be provided in a sensing chamber positioned above the mechanical seals for detecting the presence of water contamination

within the chamber. The sensing chamber shall be air filled, and shall have a drain / inspection plug with a positive anti-leak seal which is easily accessible from the outside of the pump. A solid-state relay mounted in the pump control panel shall send a low voltage, low amperage signal to the probe, continuously monitoring the conductivity of the liquid in the sensing chamber. If sufficient water enters the sensing chamber through the mechanical seal system, the probe shall sense the increase in conductivity and signal the solid state relay in the control panel. The relay shall then energize a warning light on the control panel, or optionally, cause the pump shut down. This system shall provide an early warning of mechanical seal leakage, thereby preventing damage to the submersible pump, and allowing scheduled rather than emergency maintenance.

2.13 SHAFT

A. The pump shaft and motor shaft shall be an integral, one piece unit adequately designed to meet the maximum torque required at any normal start-up condition or operating point in the system. The shaft shall have a full shutoff head design safety factor of 1.7, and the maximum shaft deflection shall not exceed .05 mm (.002 inch) at the lower seal during normal pump operation. Each shaft shall be stainless steel 1.4021 (AISI 420) material, and shall have a polished finish with accurately machined shoulders to accommodate bearings, seals and impeller. Carbon steel, chrome plated, or multi piece welded shafts shall not be considered adequate or equal.

2.14 BEARINGS

A. Each pump shaft shall rotate on high quality permanently lubricated, greased bearings. The upper bearing shall be a cylindrical roller bearing and the lower bearings shall be a matched set of at least three heavy duty bearings, two angular contact ball bearings and one cylindrical roller bearing. All three lower bearings shall have identical outer race diameters to provide maximum bearing load capacity. Designs which utilize a roller bearing with a smaller outer diameter than the other bearings in the assembly do not provide maximum load capacity and shall not be considered equal. Bearings shall be of sufficient size and properly spaced to transfer all radial and axial loads to the pump housing and minimize shaft deflection. The bearing life shall be a minimum of 100,000 hours at flows ranging from 1/2 of BEP flow to 1-1/2 times BEP flow (BEP is best efficiency point). The bearings shall be manufactured by a major internationally known manufacturer of high quality bearings, and shall be stamped with the manufacturer’s name and size designation on the race.

2.15 POWER CABLE AND ENTRY/JUNCTION CHAMBER

A. The power cables shall be sized according to NEC and CSA standards and shall be of sufficient length to reach the junction box without requiring splices. The outer jacket of the cable shall be oil, water, and UV resistant, and shall be capable of continuous submerged operation underwater to a depth of 65 feet.

B. The cable entry design shall not require a specific torque to insure a watertight seal. The cable entry shall consist of cylindrical elastomer grommets, flanked by stainless steel washers. A cable cap incorporating a strain relief and bend radius limiter shall mount to the cable entry boss, compressing the grommet ID to the cable while the grommet OD seals against the bore of the cable entry. The junction chamber shall be isolated and sealed from the motor by means of sealing glands. Electrical connections between the power cables and motor leads shall be made via a compression or post type terminal board, allowing for easy disconnection and maintenance.

2.16 VALVES AND PIPING

A. Each pump shall be provided with a full flow type check valve with flanged ends and fitted with an external lever and spring. Each valve shall be capable of passing a three (3) inch diameter spherical solid. The valve seat shall be constructed of stainless steel, secured to the

body to ensure concentricity, sealed by an O-ring, and shall be replaceable. The valve body shall be cast iron and incorporate a cleanout port large enough to allow removal and/or replacement of the valve clapper without removing valve or piping from the line. Valve clapper shall have a molded neoprene seating surface incorporating low pressure sealing rings. Valve hinge pin and internal hinge arm shall be stainless steel supported on each end in brass bushings. Shaft nut shall have double O-rings which shall be easily replaceable without requiring access to interior of valve body. Valve shall be rated at 175 PSI water working pressure, 350 PSI hydrostatic test pressure.

B. The discharge header shall include a check valve and plug valve for each pump to permit pumps to be isolated from the common discharge header. Valves shall have ports designed to pass spherical solids equal to the pumps capability.

C. The valve vault shall house a service tap with pressure gauge reading between 0 and 100 psi on each discharge piping to confirm pump operating point.

D. Valves shall provide visual indication of valve closure, and shall operate solely on discharge pressure. Valves which require connection to the suction line shall not be acceptable. All valve parts exposed to sewage shall be constructed of cast iron, stainless steel, or similar corrosion resistant materials. Diaphragms, if used, shall be of fabric reinforced neoprene or similar inert material. A cleanout port, three (3) inches in diameter, shall be provided for ease of inspection, cleanout, and service. Valves shall be field adjustable for varying discharge heads.

E. Each pump shall be equipped with a glycerin-filled compound gauge to monitor suction pressures, and a glycerin-filled pressure gauge to monitor discharge pressures. Gauges shall be a minimum of four (4) inches in diameter, and shall be graduated in feet water column. Rated accuracy shall be one (1) percent of full scale reading. Pressure gauges shall be graduated 0 to 100 psi minimum. Gauges shall be mounted on tapped on discharge piping with service saddle ball valve and pressure gauge. They shall be housed within the valve vault on a discharge piping from each pump to confirm pump operating point. Gauge installations shall be complete with all hoses and stainless steel fittings, and shall include a shutoff valve installed in each gauge inlet at the point of connection to suction and discharge pipes.

F. Piping

1. Flanged header pipe shall be centrifugally cast, ductile iron, complying with ANSI/AWWA A21.51/C115 and class 53 thickness.

2. Flanges shall be cast iron class 125 and Comply with ANSI B16.1.

3. Pipe and flanges shall be threaded and suitable thread sealant applied before assembling flange to pipe.

4. Bolt holes shall be in angular alignment within 1/2^{o} between flanges. Flanges shall be faced with a gasket finish.

G. Contractor must insure all pipes connected to the pump station are supported to prevent piping loads from being transmitted to pumps or station piping. Pump station discharge force main piping shall be anchored with thrust blocks where shown on the contract drawings.

2.17 FINISH

A. Pumps, piping, and exposed steel framework shall be cleaned prior to painting. Exposed surfaces to be coated with one coat gray wide range non-lift primer and one coat white acrylic alkyd wide range enamel. Paint shall be low VOC, alkyd based, high solids, semi-gloss white enamel for optimum illumination enhancement, incorporating rust inhibitive additives. The

finish coat shall be 1.0 to 1.2 MIL dry film thickness (minimum), resistant to oil mist exposure, solvent contact, and salt spray. The factory finish shall allow for over-coating and touch up after final installation.

2.18 ELECTRICAL CONTROL COMPONENTS

A. The pump control panel will be tested as an integral unit by the pump manufacturer. The control panel shall also be tested with the pump system as a complete working system at the pump station manufacturer's facility.

B. Panel Enclosure

1. Electrical control equipment shall be mounted within a NEMA 4X stainless steel control enclosure with a single three-point stainless steel padlockable latch. Door shall be hinged and sealed with a neoprene gasket and equipped with captive closing hardware. Control components shall be mounted on a removable steel back panel secured to enclosure with collar studs.

2. All control devices and instruments shall be secured to the sub-plate with machine screws and lock washers. Mounting holes shall be drilled and tapped; self-tapping screws shall not be used to mount and component. All control devices shall be clearly labeled to indicate function.

3. Pump station controls shall conform to third party safety certification. The panel shall bear a serialized UL label listed for "Enclosed Industrial Control Panels". The enclosure, and all components mounted on the sub-panel or control cover shall conform to UL descriptions and procedures. All installation requiring penetration of the control panel shall be made in such a manner and with approved devices that will maintain the panels' NEMA 4X rating. All conduits entering the control panels or other enclosures from the wet well shall be sealed with gas-tight fittings (Myers type hubs).

B. Sub-Panel

1. Control sub-panel shall be 12-gauge steel with white enamel finish. Sub-panel shall have flanges on at least two sides. All mounting holes shall be drilled and tapped at the least 8/32" and parts mounted with stainless steel machine screws. Self-tapping screws will not be accepted

C. Inner Door

1. Provide a removable inner swing door for each door of the enclosure. Inner swing doors must be 5052 brushed marine grade aluminum having a minimum thickness of 0.090 inches. The door shall have 0.5 inch flanges on three (3) sides for increased strength. The door shall be adequately sized to enclose all panel-mounted components while having a vertical swing of a minimum of 90 degrees. Inner doors shall be held closed with a durable 1/4-turn latch. The doors shall have a brushed high gloss luster. All inner door mounted components will be labeled with phenolic engraved nameplates.

D. Panel Components

1. Pump Circuit Breakers

a. Heavy-duty, thermal-magnetic molded case pump motor circuit breakers to be manufactured by Square D Company or approved equal.

b. Pump breakers shall be accessible through inner door.

2. Reduced Voltage Solid State Starters (Soft Starters)

   a. Reduced voltage solid state starters shall be provided to start each pump. Starters shall be type Altistart 48 manufactured by Square D Company or approved equal.

   b. The RVSS shall be provided with full voltage NEMA rated bypass starters.

3. Bypass Motors

   a. NEMA rated motor starters equipped with heavy duty contactors (definite purpose contactors are not acceptable) and non-adjustable melting alloy overload protection. Starters shall be type 8536 as manufactured by Square D Company or approved equal.

4. Control Transformer

   a. A control circuit transformer shall be included to provide 115 VAC power to control components.

   b. Fuses selected according to NEC requirements shall protect transformer primary and secondary. Fuse blocks shall be provided with lights for indication of a blown fuse.

5. Surge Protective Device (SPD)

   a. SPD with a minimum surge current rating of 40,000A shall be provided. The SPD shall have LED status indicator lights. It shall be manufactured by Square D Company or approved equal.

6. Three Phase Voltage Monitor

   a. A three phase voltage monitor shall be plug-in pin type as manufactured by Diversified Corporation or approved equal. It shall monitor:

      1) Phase failure
      2) Phase reversal
      3) Low voltage (Brown outs)

7. Pump Protection

   a. Over-temperature protection shall be provided in the control panel to operate in conjunction with the over-temperature switch in each pump motor. The control shall provide pump lockout of operation upon occurrence of high temperature. The circuitry shall include a red failure indicating light on the inner panel for each pump as an alarm indication.

   b. Overload protection shall be provided in the control panel. The control shall provide pump lockout of operation upon occurrence of high temperature. The circuitry shall include a red failure indicating light on the inner panel for each pump as an alarm indication.

   c. Pump seal failure protection shall be provided in the control panel to operate in conjunction with the moisture sensor or seal failure switch in each pump motor. Seal leaks shall be detected for in the motor housing and seal chamber. The circuitry shall include a red failure indicating light on the inner panel for each pump as an alarm indication. The pumps shall be allowed to

continue to run. Seal failure relays shall be the electronic plug-in pin type with indicator light as manufactured by ATC Diversified or approved equal.

8. Automatic electrical alternator shall be ATC Diversified ARA120ABA or approved equal.

9. Control relays shall be plug-in blade type with indicator light. They shall be Idec type RR3B or approved equal.

10. A time delay relay shall be provided to insure that both pumps do not restart simultaneously in the event of a power loss. Timer shall be Idec type RTE or approved equal.

11. Power terminals and control terminals shall have minimum 1/4" flat head set screws. Terminals shall be mounted on raised angled din rail for easy field access.

E. Indication and Operator Interface (mounted on panel inner doors)

1. Each pump will have a three-position switch to select 'Manual-Off-Automatic' position.

2. Each pump shall have elapsed time meter mounted on the inner door. Meters shall be wired to each starter, six digit, non-resettable, to indicate total run time in hours and tenths.

3. The following indicating lamps shall be provided:

a. Pump Running per pump (green)

b. Pump Overtemp per pump (red)

c. Pump Overload per pump (red)

d. Pump Seal Failure per pump (red)

4. Pushbuttons shall be provided for:

a. Alarm Horn Silence (externally mounted)

b. Reset Motor Overload per pump

5. All lights and switches shall be SKS type manufactured by Square D Company or approved equal.

6. All door-mounted components shall have engraved nameplates (Two-ply laminated plastic; black letters, white background).

F. Alarm System

1. A flashing alarm light with a minimum 40 watt light bulb shall be installed at the panel and located as to be readily visible from the main road. Alarm light shall be approved for vapor tight top installation and shall have a red lexan globe.

2. A weatherproof alarm horn with back box shall be mounted on the side of the enclosure. Horn shall have a minimum 87 DBA output. The horn silencer shall be mounted on the front enclosure door.

3. Alarm horn and light shall be on at high level.

G. Wiring and Labeling

1. Power wiring shall be properly sized MTW rated 90 degrees C. Control wiring shall be red #14 AWG, MTW, rated 90 degrees C. All panel wiring shall have polyester or vinyl-cloth numerically identified labels on each end to indicate wire number. Labels will be manufactured by Brady or approved equal. Wire will be neatly routed in the panel through polyester wire duct except from the backplate to the inner door, which shall be wrapped in a separate bundled harness for control.

2. A laminated “As-Built” wiring schematic shall be posted on the inside of the inner door. A data tag with panel and manufacturer information shall be provided on inside of enclosure door.

3. All panel mounted components including control and power terminal strips will be clearly labeled according to provided wiring diagram.

4. All UL labels shall be posted where required by 508A standards.

H. Experience and Rating

1. The pump control panel manufacturer shall have at least 25 years of experience and have at least 4000 similar installations.

2. The control panel shall be UL listed and labeled as an industrial control panel under UL 508 procedures.

3. The pump control panels shall be N Series as manufactured by Control Interface or approved equal.

2.19 LIQUID LEVEL CONTROL

A. The manufacturer of the liquid level control system will be tied to the pump control panel detailed on construction drawings. Mercury float-type switches shall be included for the four (4) pump control elevations on the drawings.

B. The high water level alarm system shall be tied to existing communication system for Owner operating staff via cell phone.

C. When flow in the wet well reaches the ‘lead float’ level, the lead pump starts. If fluid recedes to the off level, the pump shuts off, if not, fluid will continue to rise until it reaches the ‘lag float’ level where the lag pump will begin to operate. Both pumps will operate until the fluid in the wet well returns to the off level where both pumps shut off. At each instance when the off float is activated, the alternator automatically reverses the sequence of pump operation allowing for equal usage of the pumps.

D. If level continues to rise to high level, alarm light will flash and horn will sound until alarm silence is pressed.

E. Control sequence shall be designed so that panel functions automatically again after a power failure and manual reset is not necessary. The control sequence shall also be designed to allow operation of the lead float as off and the lag float as lead in the event of off float failure.

2.20 SPARE PARTS

The lesser of the following shall be provided:

A. The manufacturer shall supply to the Owner the following spare parts:

1. One impeller for each capacity pump.
2. Thirty feet of lifting chain.
3. One stator of each pump/motor type.
4. One rotor of each pump/motor type.
5. Upper and lower bearings for each pump type or size.

OR

B. One (1) spare pump, in its entirety, with all associated parts, packaged for long-term storage.

PART 3 - EXECUTION

3.02 EXAMINATION

A. Contractor shall off-load equipment at installation site using equipment of sufficient size and design to prevent injury or damage. Pump system manufacturer shall provide written instruction for proper handling. Immediately after off-loading, contractor shall inspect complete pump station and appurtenances for shipping damage or missing parts. Any damage or discrepancy shall be noted in written claim with shipper prior to accepting delivery. Validate all station serial numbers and parts lists with shipping documentation. Notify the manufacturer's representative of any unacceptable conditions noted with shipper.

3.03 PREPARATION

A. Construct pre-cast wet well, valve vault with lid/hatch, etc. as shown on drawings.

3.04 INSTALLATION

A. Install, level, align, and lubricate pump station as indicated on project drawings. Installation must be in accordance with written instructions supplied by the manufacturer at time of delivery.

B. Suction pipe connections are vacuum tight. Fasteners at all pipe connections must be tight. Install pipe with supports and thrust blocks to prevent strain and vibration on pump station piping. Install and secure all service lines (level control, air release valve or pump drain lines) as required in wet well.

C. Check motor and control data plates for compatibility to site voltage. Install and test the station ground prior to connecting line voltage to station control panel.

D. Prior to applying electrical power to any motors or control equipment, check all wiring for tight connection. Verify that protective devices (fuses and circuit breakers) conform to project design documents. Manually operate circuit breakers and switches to ensure operation without binding. Open all circuit breakers and disconnects before connecting utility power. Verify line voltage, phase sequence and ground before actual start-up.

3.05 FIELD QUALITY CONTROL

A. 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 form 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.

B. Manufacturer's Start-up Services

Coordinate station start-up with manufacturer's technical representative. The representative or factory service technician will inspect the completed installation. The services of a qualified service engineer to check the installation, supervise start-up, operation, adjust all controls for optimum equipment operation, and instruct and train owners personnel in the proper and most efficient operation and maintenance of the screening system be provided by the manufacturer for minimum 1 Man-Day or as required for complete installation and start-up.

3.06 CLEANING

A. Prior to acceptance, inspect interior and exterior of pump station for dirt, splashed material or damaged paint. Clean or repair accordingly. Remove from the job site all tools, surplus materials, scrap and debris.

B. Remove dirt, grime, marks, etc., from pumps.

3.07 PROTECTION

A. The pumps should be placed into service immediately. If operation is delayed. Pump and its components shall be stored and maintained per manufacturer's written instructions.

3.08 MEASUREMENT AND PAYMENT

A. No separate measurement or direct payment will be made for the work under this Section and all costs for same shall be included in the price bid for the item to which it pertains.

END OF SECTION

SECTION 33 41 00

STORM DRAINAGE PIPING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Storm drainage piping, fittings, and accessories.

B. Drop Inlets, Site surface drainage, Detention outlet structure and Detention basin.

1.02 RELATED REQUIREMENTS

A. Section 31 23 16 – Excavation

B. Section 31 23 23.13 – Backfill and Compaction

C. Section 31 23 16.13 - Trenching for Site Utilities

D. Section 03 30 00 - Cast-in-Place Concrete.

1.03 DEFINITIONS

A. Bedding: Fill placed under, beside and directly over pipe, prior to subsequent backfill operations.

1.04 REFERENCE STANDARDS

A. AASHTO M 36 - Standard Specification for Corrugated Steel Pipe, Metallic-Coated, for Sewers and Drains; American Association of State Highway and Transportation Officials; 2003.

B. ASTM A74 - Standard Specification for Cast Iron Soil Pipe and Fittings; 2013a.

C. ASTM C12 - Standard Practice for Installing Vitrified Clay Pipe Lines; 2013.

D. ASTM C14 - Standard Specification for Non-reinforced Concrete Sewer, Storm Drain, and Culvert Pipe; 2011.

E. ASTM C14M - Standard Specification for Non-reinforced Concrete Sewer, Storm Drain, and Culvert Pipe [Metric]; 2011.

F. ASTM C76 - Standard Specification for Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe; 2013a.

G. ASTM C76M - Standard Specification for Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe [Metric]; 2013a.

H. ASTM C425 - Standard Specification for Compression Joints for Vitrified Clay Pipe and Fittings; 2004 (Reapproved 2009).

I. ASTM C443 - Standard Specification for Joints for Concrete Pipe and Manholes, Using Rubber Gaskets; 2012.

J. ASTM C443M - Standard Specification for Joints for Concrete Pipe and Manholes, Using Rubber Gaskets (Metric); 2011.

K. ASTM C700 - Standard Specification for Vitrified Clay Pipe, Extra Strength, Standard Strength, and Perforated; 2011.

L. ASTM D1785 - Standard Specification for Poly (Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120; 2012.

M. ASTM D2321 - Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications; 2011.

N. ASTM D2729 - Standard Specification for Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings; 2011.

O. ASTM D2751 - Standard Specification for Acrylonitrile-Butadiene-Styrene (ABS) Sewer Pipe and Fittings; 2005.

P. ASTM D3034 - Standard Specification for Type PSM Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings; 2008.

1.05 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data indicating pipe, pipe accessories, and pipe class.

C. Manufacturer's Installation Instructions: Indicate special procedures required to install Products specified.

D. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

E. Project Record Documents:

1. Record location of pipe runs, connections, catch basins, cleanouts, and invert elevations.

2. Identify and describe unexpected variations to subsoil conditions or discovery of uncharted utilities.

1.06 REGULATORY REQUIREMENTS

A. Conform to applicable code for materials and installation of the Work of this section.

PART 2 PRODUCTS

2.01 PIPE MATERIALS

A. Concrete Pipe: Reinforced, ASTM C 76 (ASTM C 76M), Class III with Wall Type A; mesh, Tongue and Groove end joints.

B. Furnish pipe with joints designed for flexible watertight gaskets.

C. Reinforced Concrete Pipe Joint Device: ASTM C443 (ASTM C443M) rubber compression gasket joint.

2.02 CATCH BASIN, TRENCH DRAIN, CLEANOUT, AND AREA DRAIN COMPONENTS

A. Precast drop inlets, catch basins, outlet structures, etc. shall be as manufactured by Tindall Concrete Products, Inc. or equal units by others

B. All other precast structures (i.e., headwalls, flared end sections, etc.) shall be approved by Engineer prior to installation.

C. Use precast manholes:

1. Provide reinforced precast concrete ring and eccentric cone sections complying with ASTM C-478 and the following.

2. Use Portland cement complying with ASTM C-150, Type II.

3. Cast ladder rungs into the units.

4. Provide tongue and groove or O-ring rubber gasketed joints.

5. Use vulcanized butyl rubber sealant with tongue and groove joints.

6. Provide flat slab tops where manhole depth is less than 4'0".

D. Steps:

1. Use aluminum or plastic steps.

2. Provide steps having non-skid top surfaces, safety stops at each end, minimum width of 10" and not less than 5" projection from wall.

3. Aluminum steps shall support 1000-pound load at center with no deformation, coat embedded ends with bituminous paint.

4. Provide polypropylene plastic steps reinforced with 3/8" diameter steel rod, M.S.A. Industries, Inc. Model PS-K, or equal.

E. Frames and covers:

1. Provide gray iron castings, complying with ASTM A 48, Class 30 iron.

2. Machine all bearing surfaces.

3. Provide frames weighing not less than 195 lbs. with inside opening between 21" and 24".

4. Provide circular cover with two "pick" holes and weighing not less than 120 lbs.

5. Covers to have the words "STORM SEWER" cast in the metal.

6. Coat frames and covers with two (2) shop coats of bitumastic paint.

7. Provide watertight covers, where indicated, conforming to above requirements and with frame tapped for four bolts, countersunk in cover.

a. Provide rubber gasket between frame and cover.

2.03 BEDDING AND COVER MATERIALS

A. Bedding: As specified in Section 31 23 23.13.

B. Cover: As specified in Section 31 23 23.13.

2.04 OTHER MATERIALS

A. Provide other materials, not specifically described but required for a complete and proper installation, as selected by the Contractor subject to the approval of the Engineer.

PART 3 EXECUTION

3.01 TRENCHING

A. See Section 31 23 23.13 for additional requirements.

B. Hand trim excavation for accurate placement of pipe to elevations indicated.

C. Backfill around sides and to top of pipe with cover fill, tamp in place and compact, then complete backfilling.

3.02 INSTALLATION – PIPE

A. Verify that trench cut is ready to receive work and excavations, dimensions, and elevations are as indicated on layout drawings.

B. Install pipe, fittings, and accessories in accordance with manufacturer's instructions. Seal watertight.

1. Plastic Pipe: Also comply with ASTM D2321.

C. Lay pipe to slope gradients noted on layout drawings; with maximum variation from true slope of 1/8 inch in 10 feet.

D. Connect to building storm drainage system, foundation drainage system, and utility/municipal sewer system.

E. Make connections through walls through sleeved openings, where provided.

F. Connect to building collection pits, through installed sleeves.

3.03 INSTALLATION - CATCH BASINS, TRENCH DRAINS AND CLEANOUTS

A. Form bottom of excavation clean and smooth to correct elevation.

B. Form and place cast-in-place concrete base pad, with provision for sanitary sewer pipe end sections.

C. Level top surface of base pad; sleeve concrete shaft sections to receive storm sewer pipe sections.

D. Establish elevations and pipe inverts for inlets and outlets as indicated.

E. Mount lid and frame level in grout, secured to top cone section to elevation indicated.

3.04 FIELD QUALITY CONTROL

A. If tests indicate Work does not meet specified requirements, remove Work, replace and retest at no cost to Owner.

3.05 PROTECTION

A. Protect pipe and bedding cover from damage or displacement until backfilling operation is in progress.

END OF SECTION