

SPECIFICATIONS

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**SECTION 01050
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 including, but not necessarily limited to:
 - 1. Provide all staking required to construct the facility from base lines established by the Engineer.
 - 2. Establish proper line and levels for installation of utilities.
- B. Related work:
 - 1. Documents affecting work of this Section include, but are not necessarily limited to, General Conditions and Sections in Division 1 of these Specifications.
 - 2. Additional requirements for field engineering also may be described in other Sections of these Specifications.
 - 3. Section 02200 - Site Preparation.
 - 4. Section 02315 - Excavation.
 - 5. Section 02741 – Asphaltic concrete Paving.
 - 6. Section 02635 - Storm Drainage Piping.
 - 7. Section 03300 - Cast-in-Place Concrete

1.02 QUALITY ASSURANCE

- A. Provide a competent survey party and surveying instruments for staking the work.
- B. Exercise proper precautions to verify the figures shown on the Drawings prior to laying out 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 error or discrepancies discovered in the Drawings or Specifications in order that proper corrections may be made.

1.03 PROCEDURES

- A. Locate and protect control points before starting work on the site.
- B. Preserve permanent reference points during progress of the Work.
- C. Do not change or relocate reference points or items of the Work without specific approval from the Engineer.
- D. Promptly advise the Engineer when a reference point is lost or destroyed, or requires relocation because of other changes in the Work.

END OF SECTION

**SECTION 01060
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. The Contractor is to obtain copies of all applicable permits for the project and acknowledges agreement of any special conditions of the permits.
- 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.
- D. 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.
- E. 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 TRAFFIC REQUIREMENTS

- A. The Contractor shall comply with Part V of the South Carolina Manual on Uniform Traffic Control Devices for Streets and Highways.

1.03 INSPECTION BY AGENCIES:

- A. The representatives of the South Carolina Department of Health and Environmental Control, Farmers Home Administration, Environmental Protection Agency, and the 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.

1.04 WITHHOLDING FOR NONRESIDENTS: (REQUIRED IF CONTRACTOR HOME OFFICE IS OUT OF STATE)

- A. Attention of non-resident Contractors is invited to Code Sections 12-8-540 and 12-8-550 as amended effective July 1, 1994, Section 49, Appropriations Bill, Part II.
- B. If a non-resident Contractor is the successful bidder on this project, he shall be required to provide the Owner with an Affidavit (Form I-312, Nonresident Taxpayer Registration Affidavit Income Tax Withholding) affirming registration with the South Carolina Department of Revenue or the South Carolina Secretary of State offices. (See attached form).
- C. Forms to register for all taxes administered by the South Carolina Department of Revenue may be obtained by calling the License and Registration Section at (803) 737-4872 or writing to South Carolina Department of Revenue, Registration Unit, Columbia, South Carolina 29214-0140.
- D. In the absence of an Affidavit being provided, withholding in the amount of two (2) percent of the contract price will be made by the Owner.

1.05 BYPASSING OF WASTEWATER: NO WASTEWATER BYPASSING WILL BE PERMITTED DURING CONSTRUCTION UNLESS A SCHEDULE HAS BEEN APPROVED BY THE SOUTH CAROLINA DEPARTMENT OF HEALTH AND ENVIRONMENTAL CONTROL, IF REQUIRED PURSUANT TO THE TERMS OF THE NPDES PERMIT.

PART 2 – PRODUCTS - NOT USED

PART 3 – EXECUTION - NOT USED

END OF SECTION

SECTION 01061
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:
 - 1. Encroachment permits, South Carolina Department of Transportation.
 - 2. Encroachment permits, County or Local Government.
 - 3. Easements obtained and or required to cross private property.
 - 4. Corps of Engineer permits, navigable waters, etc.
 - 5. South Carolina Water Resources permits.
 - 6. South Carolina Department of Health and Environmental Control, Permit to Construct.
- C. Related work: Documents affecting work of this section include, but are not necessarily limited to, General Conditions and Sections in Division 1 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 BUILDING PERMITS

- A. Secure and pay for all building permits required, whether of temporary or permanent nature.

3.03 BUILDING PERMITS

- A. Permits of a temporary nature necessary for the prosecution of the Work shall be secured and paid for by the Contractor.
- B. Permits for permanent structures or permanent changes in existing facilities shall be secured and paid for by the Owner.

3.04 RIGHTS-OF-WAY, UTILITY LINES

- A. Owner will provide the required rights-of-way or easements for construction of utility lines, whether on privately or publicly owned property.
- B. The Contractor shall confine his activities to the project limits of disturbance as illustrated on the Construction Plans unless otherwise authorized by the Owner.
- C. The Owner will provide no right-of-way over other property.

3.05 LAND

- A. The necessary land for construction of the proposed improvements will be provided by the Owner.

END OF SECTION

**SECTION 01090
REFERENCE STANDARDS**

PART 1 - GENERAL

1.01 DESCRIPTION

- A. Throughout these Contract Documents and Construction Plans, 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 and Construction Plans, 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. AISI 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 01300
ADMINISTRATIVE REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Preconstruction meeting.
- B. Site mobilization meeting.
- C. Progress meetings.
- D. Construction progress schedule.
- E. Progress photographs.
- F. Coordination drawings.
- G. Submittals for review, information, and project closeout.
- H. Number of copies of submittals.
- I. Submittal procedures.

1.02 RELATED REQUIREMENTS

- A. Section 01310 - Closeout Submittals: Project record documents.
- B. Sections throughout these specifications may include other submittals that may be required for construction.

1.03 PROJECT COORDINATION

- A. Project Coordinator: Engineer.
- B. During construction, coordinate use of site and facilities through the Engineer.
- C. 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.
- D. Comply with instructions of the Project Coordinator for use of temporary utilities and construction facilities.
- E. Coordinate field engineering and layout work under instructions of the Project Coordinator.
- F. Make the following types of submittals to Engineer through the Project Coordinator:
 - 1. Requests for interpretation.
 - 2. Requests for substitution.
 - 3. Shop drawings, product data, and samples.
 - 4. Test and inspection reports.
 - 5. Design data.
 - 6. Manufacturer's instructions and field reports.
 - 7. Applications for payment and change order requests.
 - 8. Progress schedules.
 - 9. Coordination drawings.
 - 10. 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 Conference will be held prior to actual start of construction.

- B. For the individuals designated by the Contractor, his subcontractors and suppliers attending the Preconstruction Conference, 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. South Carolina Department of Transportation (if possible)
 - 4. South Carolina Department of Health and Environmental Control (If possible)
 - 5. Contractor
- E. Agenda:
 - 1. Arrangement of Contractor's forces and personnel and those of subcontractors, materials suppliers and the Engineer.
 - 2. Channels and procedures for communication.
 - 3. Designation of personnel representing the parties to Contract, Contractor, Owner and Engineer.
 - 4. Procedures and processing of field decisions, submittals, substitutions, applications for payments, proposal request, Change Orders, and Contract closeout procedures.
 - 5. Scheduling.
 - 6. Scheduling activities of a Geotechnical Engineer.
 - 7. Rules and regulations governing performance of the Work.
 - 8. 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 two 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. Schedule and administer meetings throughout progress of the Work at maximum 2 week intervals.
- B. Contractor will make arrangements for meetings, prepare agenda with copies for participants, preside at meetings.
- C. The Contractor's relations with his subcontractors and material suppliers, and discussions with regards to this items, are the Contractor's responsibility and normally not part of the project meeting agenda.
- 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 Bi-weekly or, at a minimum, monthly.
 - 2. Coordinate as necessary to establish mutually acceptable schedule for meetings.
- F. 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. Review of off-site fabrication and delivery schedules.
 - 7. Maintenance of progress schedule.
 - 8. Corrective measures to regain projected schedules.
 - 9. Planned progress during succeeding work period.

10. Coordination of projected progress.
 11. Maintenance of quality and work standards.
 12. Effect of proposed changes on progress schedule and coordination.
 13. Other business relating to Work.
- G. Project Meeting minutes will be recorded and distributed within ten (10) days after meeting to participants, with two copies to the Contractor and the required number of copies to the Owner, and those affected by decisions made.
- H. 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. Within 14 days after date of the Agreement, submit preliminary schedule defining planned operations for the first 60 days of Work, with a general outline for remainder of Work.
- B. If preliminary schedule requires revision after review, submit revised schedule within 10 days.
- C. Within 30 days after review of preliminary schedule, submit draft of proposed complete schedule for review.
- D. Include written certification that major contractors have reviewed and accepted proposed schedule.
- E. Within 10 days after joint review, submit complete schedule.
- F. Submit updated schedule with each Application for Payment.
- G. Submit photographs with each application for payment, taken not more than 3 days prior to submission of application for payment.
- H. Maintain one set of all photographs at project site for reference; same copies as submitted, identified as such.
- I. Photography Type: Digital; electronic files.
 1. Provide photographs of site and construction throughout progress of Work produced by an experienced photographer, acceptable to Engineer.
- J. In addition to periodic, recurring views, take photographs of each of the following events:
 1. Completion of site clearing.
 - a. Excavations in progress.
 - b. Foundations in progress and upon completion.
 - c. Structural framing in progress and upon completion.
 - d. Enclosure of building, upon completion.
 - e. Final completion, minimum of ten (10) photos.
- K. Digital Photographs: 24 bit color, minimum resolution of 1024 by 768, in JPG format; provide files unaltered by photo editing software.
 1. Delivery Medium: Via email.
 2. File Naming: Include project identification, date and time of view, and view identification.
 3. PDF File: Assemble all photos into printable pages in PDF format, with 2 to 3 photos per page, each photo labeled with file name; one PDF file per submittal.

3.04 SUBMITTALS FOR REVIEW

- A. When the following are specified in individual sections, submit them for review:
 1. Product data.
 2. Shop drawings.

- 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.

3.05 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.
- B. Submit for Owner's benefit during and after project completion.

3.06 NUMBER OF COPIES OF SUBMITTALS

- A. Documents for Review:
 - 1. Shop Drawings
 - a. Scale and measurements: Make shop drawings accurately to a scale sufficiently large to show all pertinent aspects of the item and its method of connection to the Work.
 - b. Manufacturer's literature:
 - 1) 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.
 - 2) Submit the number of copies which are required to be returned, plus three (3) copies which will be retained by the Engineer.
 - c. Do not begin fabrication of equipment or materials prior to Engineer's approval of shop drawings.
 - 2. Small Size Sheets, Not Larger Than 8-1/2 x 11 inches: Submit the number of copies that Contractor requires, plus 3 that will be retained by Engineer.
- B. Documents for Information: Submit three (3) copies.
- 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; two (2) 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.

3.07 SUBMITTAL PROCEDURES

- A. Transmit each submittal with an approved form, that stipulates that the items submitted complies or does 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. Identify Project, Contractor, Subcontractor or supplier; pertinent drawing and detail number, and specification section number, as appropriate on each copy.
- F. 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.
- G. Shop drawings and related materials shall be returned with comments provided that each submission has been specified and is stamped by the Contractor.
- H. Shop drawings or material not specified or which have not been approved by the Contractor shall be returned without comment.
- I. 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 is an illustration of the stamp to 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

- J. 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.
- K. Consecutively number all submittals.
- 1. When material is resubmitted for any reason, transmit under a new letter of transmittal and with a new transmittal number.
 - 2. On resubmittals, cite the original submittal number for reference.
- L. Accompany each submittal with a letter of transmittal showing all information required for identification and checking.
- M. 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.
- N. 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.
- O. Unrequired submittals will not be reviewed by the Engineer.
- P. 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.
- Q. 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.
- R. 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.
- S. 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.
- T. 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.
 - 1) If the Contractor considers any required revision to be a change, he shall so notify the Engineer as provided for in the General Conditions.
 - 2) Make only those revisions directed or approved by the Engineer.
 - 3) 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.

- U. Deliver submittals to Engineer at PO Box 8147 Columbia, SC 29202-8147.
- V. Schedule submittals to expedite the Project, and coordinate submission of related items.
- W. For each submittal for review, allow twenty-five (25) working days excluding delivery time to and from the Contractor.
- X. Identify variations from Contract Documents and Product or system limitations that may be detrimental to successful performance of the completed Work.
- Y. Provide space for Contractor and Engineer review stamps.
- Z. When revised for resubmission, identify all changes made since previous submission.
- AA. Distribute reviewed submittals as appropriate. Instruct parties to promptly report any inability to comply with requirements.
- AB. Submittals not requested will not be recognized or processed.

END OF SECTION

**SECTION 01310
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 01300 - Administrative Requirements
- B. Individual Product Sections: Specific requirements for operation and maintenance data.
- C. Individual Product Sections: Warranties required for specific products or Work.

1.03 SUBMITTALS

- A. Project Record Documents: Submit documents to Engineer 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. Engineer 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 Owner, submit completed documents within ten days after acceptance.
 - 3. Submit one (1) copy of completed documents fifteen (15) days prior to final inspection. This copy will be reviewed and returned after final inspection, with Engineer 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 ten (10) days after final inspection.
- C. Warranties and Bonds:
 - 1. For equipment or component parts of equipment put into service during construction with Owner's 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. Specifications.
 - 3. Addenda.
 - 4. Change Orders and other modifications to the Contract.
 - 5. Reviewed shop drawings, product data, and samples.
 - 6. Manufacturer's instruction for assembly, installation, and adjusting.
- B. Ensure entries are complete and accurate, enabling future reference by Owner.
- C. Store record documents separate from documents used for construction.
- D. Record information concurrent with construction progress.

- E. Specifications: Legibly mark and record at each product section description of actual products installed, including the following:
 1. Manufacturer's name and product model and number.
 2. Product substitutions or alternates utilized.
 3. Changes made by Addenda and modifications.
- F. Record Drawings and Shop Drawings: Legibly mark each item to record actual construction including:
 1. Measured depths of foundations in relation to finish first floor datum.
 2. Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements.
 3. Measured locations of internal utilities and appurtenances concealed in construction, referenced to visible and accessible features of the Work.
 4. Field changes of dimension and detail.
 5. 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 DATA FOR MATERIALS AND FINISHES

- A. For Each Product, Applied Material, and Finish
- B. Product data, with catalog number, size, composition, and color and texture designations.
 1. Information for re-ordering custom manufactured products.
- C. Instructions for Care and Maintenance: Manufacturer's recommendations for cleaning agents and methods, precautions against detrimental cleaning agents and methods, and recommended schedule for cleaning and maintenance.
- D. Moisture protection and weather-exposed products: Include product data listing applicable reference standards, chemical composition, and details of installation. Provide recommendations for inspections, maintenance, and repair.
- E. Additional information as specified in individual product specification sections.
- F. Provide a listing in Table of Contents for design data, with tabbed fly sheet and space for insertion of data.

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 Owner's 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.
- E. Include originals of each in operation and maintenance manuals, indexed separately on Table of Contents.

- F. Manual: Bind in commercial quality 8-1/2 by 11 inch three D side ring binders with durable plastic covers.
- G. Cover: Identify each binder with typed or printed title WARRANTIES AND BONDS, with title of Project; name, address and telephone number of Contractor and equipment supplier; and name of responsible company principal.
- H. Table of Contents: Neatly typed, in the sequence of the Table of Contents of the Project Manual, with each item identified with the number and title of the specification section in which specified, and the name of product or work item.
- I. Separate each warranty or bond with index tab sheets keyed to the Table of Contents listing. Provide full information, using separate typed sheets as necessary. List Subcontractor, supplier, and manufacturer, with name, address, and telephone number of responsible principal.

END OF SECTION

SECTION 01400
QUALITY REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. References and standards.
- B. Control of installation.
- C. Testing and inspection services.
- D. Cooperate with the Owner's selected testing agency and all others responsible for testing and inspecting the work.
- E. 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. Document 00 7200 - General Conditions: Inspections and approvals required by public authorities.
- B. Section 01 6000 - 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 WORK NOT INCLUDED:

- A. Selection of testing laboratory: The Owner will select a prequalified independent testing laboratory.
- B. Payment for initial testing: The Owner will pay for all initial services of the testing laboratory 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 C1077 - Standard Practice for Laboratories Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Laboratory Evaluation; 2009.
- B. ASTM D3740 - 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 E329 - 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 Engineer and to Contractor.
 - 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 Engineer, provide interpretation of results.
2. Test report submittals are for Engineer'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 Aiken County's information.
- C. Certificates: When specified in individual specification sections, submit certification by the manufacturer and Contractor or installation/application subcontractor to Engineer, 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 Engineer.
- 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 Aiken County'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 Engineer before proceeding.
- F. Neither the contractual relationships, duties, or responsibilities of the parties in Contract nor those of Engineer 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 01300.
- 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. Initial services:
 - 1. The Owner will pay for initial testing services requested by the Owner.

2. When initial tests indicate non-compliance with the Contract Documents, the costs of initial tests associated with that non-compliance will be deducted by the Owner from the Contract Sum.
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 and all costs there from will be deducted by the Owner from the contract sum.

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 Engineer 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 Engineer 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 Engineer and Contractor of observed irregularities or non-conformance of Work or products.
 - 5. Perform additional tests and inspections required by Engineer.
 - 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. Deliver to agency at designated location, adequate samples of materials proposed to be used that require testing, along with proposed mix designs.
 - 2. Cooperate with laboratory personnel, and provide access to the Work and to manufacturers' facilities.
 - 3. Provide incidental labor and facilities:
 - a. To provide access to Work to be tested/inspected.
 - b. To obtain and handle samples at the site or at source of Products to be tested/inspected.
 - c. To facilitate tests/inspections.
 - d. To provide storage and curing of test samples.
 - 4. Notify Engineer and laboratory twenty-four (24) hours prior to expected time for operations requiring testing/inspection services.
 - 5. Employ services of an independent qualified testing laboratory and pay for additional samples, tests, and inspections required by Contractor beyond specified requirements.
 - 6. Arrange with Aiken County'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 Engineer.
- 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 Engineer. 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 Engineer, it is not practical to remove and replace the Work, Engineer will direct an appropriate remedy or adjust payment.

END OF SECTION

**SECTION 01550
VEHICULAR ACCESS AND PARKING**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Access roads.
- B. Parking.
- C. Permanent pavements and parking facilities.
- D. Removal, repair.

PART 2 PRODUCTS - NOT USED

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. Use of designated existing on-site streets and driveways for construction traffic is permitted, however access must be provided to each resident at all times within the project limits.
- B. Provide unimpeded access for emergency vehicles. Maintain 20 foot (6 m) width driveways with turning space between and around combustible materials.
- C. Provide and maintain access to fire hydrants free of obstructions.

3.03 PARKING

- A. Locate as approved by Owner.

3.04 NEW PERMANENT PAVEMENTS

- A. Avoid traffic loading beyond paving design capacity. Tracked vehicles not allowed.

3.05 REMOVAL, REPAIR

- A. Repair existing facilities damaged by use, to original condition.
- B. Repair damage caused by installation.

END OF SECTION

**SECTION 01600
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. Procedures for Aiken County-supplied products.
- G. Maintenance materials, including extra materials, spare parts, tools, and software.
- H. 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 2113 - Instructions to Bidders: Product options and substitution procedures prior to bid date.
- B. Section 01 4000 - Quality Requirements: Product quality monitoring.
- C. Documents affecting work of this Section include, but are not necessarily limited to, General Conditions, and Sections in Division 1 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 Aiken County; notify Aiken County promptly upon discovery; protect, remove, handle, and store as directed by Aiken County.
- C. Existing materials and equipment indicated to be removed, but not to be re-used, relocated, reinstalled, delivered to the Aiken County, or otherwise indicated as to remain the property of the Aiken County, 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.
- B. Do not use products having any of the following characteristics:

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. Engineer 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 Documents.
- 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 Aiken County.
 - 4. Waives claims for additional costs or time extension that may subsequently become apparent.
 - 5. Will reimburse Aiken County and Engineer for review or redesign services associated with re-approval by authorities.
- E. Substitution Submittal Procedure:
 - 1. Submit three 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. The Engineer will notify Contractor in writing of decision to accept or reject request.

3.02 OWNER-SUPPLIED PRODUCTS

- A. Aiken County's Responsibilities:
 1. Arrange for and deliver Aiken County reviewed shop drawings, product data, and samples, to Contractor.
 2. Arrange and pay for product delivery to site.
 3. On delivery, inspect products jointly with Contractor.
 4. Submit claims for transportation damage and replace damaged, defective, or deficient items.
 5. Arrange for manufacturers' warranties, inspections, and service.
- B. Contractor's Responsibilities:
 1. Review Aiken County reviewed shop drawings, product data, and samples.
 2. Receive and unload products at site; inspect for completeness or damage jointly with Aiken County.
 3. Handle, store, install and finish products.
 4. Repair or replace items damaged after receipt.

3.03 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.

3.04 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.

3.05 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.

3.06 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 01700
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 Aiken County 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 1 of these Specifications.
- B. Other requirements for technical services are stated in other sections of these Specifications.
- C. Section 00690 - Contractor's Affidavit.
- D. Section 01300 - Administrative Requirements: Submittals procedures.
- E. Section 01400 - Quality Requirements: Testing and observation procedures.

1.03 SUBMITTALS

- A. See Section 01 3000 - 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, that the elevations and locations of the work are 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 Aiken County or separate Contractor.

1.04 QUALIFICATIONS

- A. For survey work, employ a land surveyor registered in South Carolina and acceptable to Engineer. Submit evidence of Surveyor's Errors and Omissions insurance coverage in the form of an Insurance Certificate.

1.05 PROJECT CONDITIONS

- A. Grade site to drain. Maintain excavations free of water. Provide, operate, and maintain pumping equipment.
- B. Protect site from puddling or running water. Provide water barriers as required to protect site from soil erosion.

- C. Ventilate enclosed areas to assist cure of materials, to dissipate humidity, and to prevent accumulation of dust, fumes, vapors, or gases.
- D. Dust Control: Execute work by methods to minimize raising dust from construction operations. 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 Aiken County occupancy of premises, coordinate access to site for correction of defective work and work not in accordance with Contract Documents, to minimize disruption of Aiken County'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 6000.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that existing site conditions and substrate surfaces are acceptable for subsequent work. Start of work means acceptance of existing conditions.

- B. Verify that existing substrate is capable of structural support or attachment of new work being applied or attached.
- C. Examine and verify specific conditions described in individual specification sections.
- D. Take field measurements before confirming product orders or beginning fabrication, to minimize waste due to over-ordering or misfabrication.
- E. Verify that utility services are available, of the correct characteristics, and in the correct locations.
- F. 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 Engineer 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 Engineer, Aiken County, 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 Engineer of any discrepancies discovered.
- C. Protect survey control points prior to starting site work; preserve permanent reference points during construction.
- D. Promptly report to Engineer 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 Engineer.
- 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.
 3. Building foundation, column locations, ground floor and elevations..
- 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 Engineer 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.
 - 2. Relocate items indicated on drawings.
- 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 Engineer.
- 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.
- C. Perform whatever cutting and patching is necessary to:
 - 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.
- D. 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.
- E. 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.
- F. Employ original installer to perform cutting for weather exposed and moisture resistant elements, and sight exposed surfaces.
- G. Cut rigid materials using masonry saw or core drill. Pneumatic tools not allowed without prior approval.
- H. Restore work with new products in accordance with requirements of Contract Documents.
- I. Fit work air tight to pipes, sleeves, ducts, conduit, and other penetrations through surfaces.
- J. At penetrations of fire rated walls, partitions, ceiling, or floor construction, completely seal voids with fire rated material in accordance with Section 07 8400, to full thickness of the penetrated element.
- K. 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.
- L. Refinish surfaces to match adjacent finish. For continuous surfaces, refinish to nearest intersection or natural break. For an assembly, refinish entire unit.
- M. 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.
- N. 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. Remove debris and rubbish from pipe chases, plenums, attics, crawl spaces, and other closed or remote spaces, prior to enclosing the space.
- C. Broom and vacuum clean interior areas prior to start of surface finishing, and continue cleaning to eliminate dust.
- D. 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. Remove all labels that are not permanent. Do not paint or otherwise cover fire test labels or nameplates on mechanical and electrical equipment.
- D. Clean site; sweep paved areas, rake clean landscaped surfaces.
- E. 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 1 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 the job set of 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.
 - 1) 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 Engineer.
 - 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 00690 - Contractor's Affidavit.
- C. Notify Engineer 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. Submit written certification that Contract Documents have been reviewed, work has been inspected, and that work is complete in accordance with Contract Documents and ready for Engineer's review.
- E. Correct items of work listed in executed Certificates of Substantial Completion and comply with requirements for access to Aiken County-occupied areas.
- F. 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.
- G. Notify Engineer when work is considered finally complete.
- H. Complete items of work determined by Engineer's final observation.
- I. Reobservation:
 - 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.
- J. 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 uncorrected work.
 - d. Deductions for liquidated damages.
 - e. Deductions for re-testing work.
 - f. Deductions for reobservation.
 - 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 02200
SITE PREPARATION**

PART 1 GENERAL

1.01 RELATED SECTIONS

- A. Section 01600 - Product Requirements: Handling and storage of items removed for salvage and relocation.
- B. Section 01700 - Execution and Closeout Requirements: Project conditions; protection of bench marks, survey control points, and existing construction to remain; reinstallation of removed products.
- C. Section 02210 - Clearing and Grubbing.
- D. Section 02260 - Erosion and Sediment Control.
- E. Section 02200 - Grading: Topsoil removal, and Fill: Fill material for filling holes, pits, and excavations generated as a result of removal operations.

1.02 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; 2000.

1.03 SUBMITTALS

- A. See Section 01300 - 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.

1.04 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 7000.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Fill Material: As specified in Section 02200 - Grading

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 7 days prior written notification to Aiken County.
- E. Do not close, shut off, or disrupt existing utility branches or take-offs that are in use without at least 3 days prior written notification to Aiken County.
- 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. Vegetation Removed: Do not burn, bury, landfill, or leave on site.
 - 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 (450 mm).
 - 3. Sod: Re-use on site if possible; otherwise sell if marketable, and if not, treat as specified for other vegetation removed.
- C. 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 Aiken County.

3.03 EXISTING BUILT ELEMENTS

- A. Scope:
 - 1. Remove paving and curbs as required to accomplish new work.
 - 2. Remove fences and gates as needed for new construction. Fencing not shown on the drawing to be replaced damaged by the Contractor will be replaced at no cost the Owner.
 - 3. Remove other items indicated, for salvage, relocation, recycling, and _____.
 - 4. Fill excavations, open pits, and holes in ground areas generated as result of removals, using specified fill; compact fill as required so that required rough grade elevations do not subside within one year after completion.
- B. Comply with applicable codes and regulations for demolition operations and safety of adjacent structures and the public.
 - 1. Obtain required permits.
 - 2. Comply with applicable requirements of NFPA 241.
 - 3. Use of explosives is not permitted.
 - 4. Conduct operations to minimize obstruction of public and private entrances and exits; do not obstruct required exits at any time; protect persons using entrances and exits from removal operations.
 - 5. Obtain written permission from owners of adjacent properties when demolition equipment will traverse, infringe upon or limit access to their property.
- C. Do not begin removal until vegetation to be relocated has been removed and specified measures have been taken to protect vegetation to remain.
- D. Protect existing structures and other elements that are not to be removed.
 - 1. Provide bracing and shoring.
 - 2. Prevent movement or settlement of adjacent structures.

- 3. Stop work immediately if adjacent structures appear to be in danger.
- E. If hazardous materials are discovered during removal operations, stop work and notify Engineer and Aiken County; hazardous materials include regulated asbestos containing materials, lead, PCB's, and mercury.
- F. Partial Removal of Paving and Curbs: Neatly saw cut at right angle to surface.

3.04 DEBRIS

- A. Remove debris, junk, and trash from site.

3.05 WASTE REMOVAL

- A. Remove from site all materials not to be reused on site; do not burn or bury.
- B. Leave site in clean condition, ready for subsequent work.
- C. Clean up spillage and wind-blown debris from public and private lands.

END OF SECTION

**SECTION 02210
CLEARING AND GRUBBING**

PART 1 - GENERAL

1.01 DESCRIPTION

- A. Work included: Remove all organic vegetative mater as required to complete the construction is 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 02260 - Erosion and Sediment Control.

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 completely removing the top 6-inch layer of soil and vegetative cover.
- 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. 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" 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" 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% maximum density in lawn areas and 100% 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 02260 of these specifications.

3.03 MEASUREMENT AND PAYMENT

- A. Payment will be made at the unit price per acre as stated in the Bid Form.

END OF SECTION

SECTION 02260
EROSION AND SEDIMENT CONTROL

PART 1 - GENERAL

1.01 DESCRIPTION

- A. Work included: Provide protection of the environment 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 02921 - Grassing.

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 Mirafi 700X synthetic fabric as manufactured by Celanese Fibers Co., Bidim C34 as manufactured by DuPont or approved equal.

2.04 EROSION CONTROL BLANKET

- A. Use erosion control blanket SC150, from North American Green or approved equal.

2.05 RIP-RAP

- A. Comply with Section 02373 - Rip-Rap.

2.06 FILTER FABRIC (TEMPORARY STONE CHECK DAM)

- A. Use Stablenka Filter Fabric (T-140N), Mirafil (140N) or approved equal.

2.07 SEDIMENT TUBES FOR DITCH CHECKS

- A. Refer to the SCDOT 2007 Standard Specifications for Highway Construction Section 815.2 in its entirety.

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 02921.
- 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 02921.

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.
- 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.

3.07 SEDIMENT TUBES FOR DITCH CHECKS

- A. Refer to the SCDOT 2007 Standard Specifications for Highway Construction Section 815.4 in its entirety.

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. The removal of temporary structures is to be included in the Unit Cost for installation; no additional pay item will be allocated for removal.

END OF SECTION

**SECTION 02310
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.
 - e. Construction and lining of treatment basins.
 - 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 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 02210 – Clearing and Grubbing.
- C. Section 02260 - Erosion and Sediment Control.
- D. Section 02315 - Excavation.
- E. Section 02310 - Fill: Filling and compaction.
- F. Section 02317 - Trenching: Trenching and backfilling for utilities. G.
- G. Section 02921 - Seeding: Finish ground cover.

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 PRICE AND PAYMENT PROCEDURES

- A. See Instructions to Bidders Section - Unit Prices, for general requirements relating to unit prices for this work.
- B. Topsoil:
 - 1. Includes: Excavating existing topsoil, stockpiling, scarifying substrate surface, placing where required, and compacting.

1.05 SUBMITTALS

- A. Project Record Documents: Accurately record actual locations of utilities remaining by horizontal dimensions, elevations or inverts, and slope gradients.

1.06 QUALITY ASSURANCE

- A. Perform Work in accordance with State of South Carolina, Highway Department and Aiken County 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 retained by the Owner will make such tests as are deemed advisable. 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 Owner. Subsequent tests required as a result of improper compaction shall be paid for by the Contractor.

1.07 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.

1.08 PRODUCT HANDLING

- A. Comply with pertinent provisions of Section 01600.

1.09 JOB CONDITIONS

- A. 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.

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.
- C. Other Fill Materials:
 1. **SPECIAL SOIL MATERIALS**
 - a. Provide basin liner soils consisting of fine grained soils selected from excavated area or approved borrow sites, stockpiled and then placed and compacted in areas to receive liner.
 - b. Sufficient material for the liner, as selected by the Engineer, shall be stockpiled, kept separate from other excavated materials and piled free of undesirable materials.

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 from damage above- and below-grade utilities to remain.
- 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 permits 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 discing, 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 100%
 - b. All other fill material 98%
 3. Beneath Roadways:
 - a. Top 12" of Subgrade 100%
 - b. All other fill material 95%

4. Embankments:
 - a. Top 12" of Subgrade 98%
 - b. All other fill material 95%
5. Beneath Sidewalks:
 - a. Top 12" of Subgrade 95%
 - b. All other fill material 90%
6. Lawns and unpaved areas:
 - a. All other fill material 90%
- 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 seeding are indicated.
- J. Place topsoil to the following compacted thicknesses:
 - 1. Areas to be Seeded with Grass not less than: 2 inches (50 mm).
- K. Place topsoil during dry weather.
- L. Remove roots, weeds, rocks, and foreign material while spreading topsoil.
- M. Near plants spread topsoil manually to prevent damage.
- N. Fine grade topsoil to eliminate uneven areas and low spots. Maintain profiles and contour of subgrade.
- O. Lightly compact placed topsoil.
- P. 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 0.10 foot (1-3/16 inches) (30 mm) from required elevation.
- B. Top Surface of Finish Grade: Plus or minus 0.04 foot (1/2 inch) (13 mm).
- C. Top Surface of Subgrade: Plus or minus 1/10 foot (30 mm) from required elevation.
- D. Top Surface of Finish Grade: Plus or minus 1/2 inch (13 mm).

3.07 FIELD QUALITY CONTROL

- A. See Section 02316 for compaction 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 cost to the Contractor, 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's selected 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

- 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. All work under this Section will not be measured for payment, but paid as a lump sum (LS) upon full completion of the work. Payment is full compensation for performing the work as specified or directed and includes proper removal and disposal of timber and debris and all other materials, labor, equipment, tools, supplies, transportation, and incidentals necessary to complete the work in accordance with the Plans, the Specifications, and other terms of the Contract.

END OF SECTION

**SECTION 02315
EXCAVATION**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Excavating for Utility Structures, Water and Wastewater Lines.

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 02310 – Grading: Soil removal from surface of site.
- C. Section 02310 – Grading: Grading.
- D. Section 02310 - Fill: Fill materials and compaction.
- E. Section 31 3700 - Riprap.

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. Quantities for additional or deductive rock excavation shall be as determined by the Engineer from field measurements.
 - 2. Do not perform any additional rock excavation without prior approval of the Engineer and Owner.

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, CI 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 retained by the Owner will make such tests as are deemed advisable.
 - 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 01600.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 PREPARATION

- A. Identify required lines, levels, contours, and datum locations.
- B. See Section 02200 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 bench marks, 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.

3.02 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 cu m) measured by volume.
- J. Correct areas that are over-excavated and load-bearing surfaces that are disturbed; see Section 31 2323.
- 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 2200.
- P. Remove excess excavated material from site.

3.03 DRAINAGE

- A. Provide drainage and control grading in the vicinity of the work to prevent drainage into the excavation.

3.04 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.
 - 1. Remove rock at such locations using jack hammers and bull points.

3.05 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.

3.06 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.

3.07 FIELD QUALITY CONTROL

- A. See Section 01 4000 - Quality Requirements, for general requirements for field inspection and testing.
- B. Provide for visual inspection of load-bearing excavated surfaces before placement of foundations.

3.08 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.

3.09 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 for the item to which it pertains.

END OF SECTION

**SECTION 02316
BACKFILL AND COMPACTION**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Backfilling and compacting for utilities outside the building to utility main connections.
- B. Filling holes, pits, and excavations generated as a result of removal (demolition) operations.

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 02310 - Grading: Removal and handling of soil to be re-used.
- C. Section 02310 - Grading: Site grading.
- D. Section 02315 - Excavation: Removal and handling of soil to be re-used.
- E. Section 02373 - Riprap.

1.03 REFERENCE STANDARDS

- 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; 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)); 2007.
- 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)); 2009.
- 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); 2006.
- H. ASTM D2922 - 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; 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, CI 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 01300 - 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 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.

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 retained by the Owner will make such tests as are deemed advisable.
 - 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 PRODUCT HANDLING

- A. Comply with pertinent provisions of Section 01600.

PART 2 PRODUCTS

2.01 SOIL MATERIALS 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, provide a lean concrete "mud slab" beneath foundations.
 - 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 D2487 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 4000 - 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.
- B. See Section 0 2200 for additional requirements.

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.
 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.
- K. 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.
- 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 within $\pm 2\%$.
 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 2200 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:100%
 - 2. Below top 12" of subgrade:98%
- C. Fill beneath structures and beneath an area extending 10 feet beyond the limits of the foundation:
 - 1. Top 12" of subgrade:100%
 - 2. Below top 12" of subgrade:98%
- D. Compaction of suitable material used to replace unsuitable material below foundation subgrades:
 - 1. Top 12" of subgrade:100%
 - 2. Below top 12" of subgrade:98%

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 $\pm 2\%$.
 - 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 Filling: Plus or minus 1 inch (25 mm) from required elevations.

3.08 FIELD QUALITY CONTROL

- A. See Section 01400 - 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 5000 sq.ft. of subgrade area, but not less than three tests.
 - 2. In each compacted fill layer, one field density test for every 5000 sq.ft. of overlaying paved area, but not less than three tests.
 - 3. In fill beneath structures, one field density test for every 2500 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 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 CLEANING

- 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 stockpile area to prevent standing surface water.

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 price bid for the item to which it pertains.

END OF SECTION

SECTION 02317
TRENCHING

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 012310 - Grading: Site grading.
- C. Section 02316 - Backfill and Compaction.

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; 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)); 2007.
- 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)); 2009.
- F. ASTM D2167 - Standard Test Method for Density and Unit Weight of Soil in Place by the Rubber Balloon Method; 2008.
- G. ASTM D2922 - Standard Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth); 2005.
- H. ASTM D3017 - Standard Test Method for Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth); 2005.

1.04 DEFINITIONS

- A. Finish Grade Elevations: Indicated on drawings.
- B. Subgrade Elevations: 4 inches (100 mm) below finish grade elevations indicated on drawings, unless otherwise indicated.

1.05 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.

1.06 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. Use equipment adequate in size, capacity, and numbers to accomplish the work in a timely manner.

1.07 JOB CONDITIONS

- A. Existing utilities:
 - 1. There now exists in the construction areas, waterworks, storm drainage, sanitary sewers, street paving, gas mains and other utilities.
 - 2. Approximate location of certain underground lines and structures are shown on the plans for information only, other underground lines or structures are not shown.
 - 3. Locate these and other possible unknown utility lines using electronic pipe finder, or other approved means.
 - 4. Locate, excavate and expose all existing underground lines in advance of trenching operations.
 - 5. 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.
 - 6. 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: 1-800-922-0983.
- 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. Structural Fill: Conforming to State of South Carolina Highway Department standard.

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" in greatest dimension for backfill up to 12" above top of utility being covered.
 2. Do not permit rocks larger than 2" in greatest dimension in top 6" 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.

PART 3 EXECUTION

3.01 EXAMINATION

3.02 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 South Carolina Department of Transportation's (SCDOT) "Encroachment Permit" issued for the Work, and the South Carolina Department of Transportation's (SCDOT) "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.

3.03 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 (1.2 meters) 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 excavated material that is unsuitable for re-use from site.
- G. Stockpile excavated material to be re-used in area designated on site in accordance with Section 31 2200.
- H. Remove excess excavated material from site.
- I. Trench Excavation:
 1. Remove all materials of whatever substance encountered.
- J. Where trenching occurs in existing lawns, remove turf in sections and keep damp. Replace turf upon completion of the backfilling.
- K. 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" 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.
- L. 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.
- M. 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' deep for sewers 15" and larger in size, shall remain in place and be cut off no less than 2" 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' 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.
- N. 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" below the trench depth indicated or specified, and to provide 6" clearance in any horizontal direction from all parts of the utility and appurtenances.
- O. Special requirements relating to excavation for specific types of utilities shall comply with the following:
 - 1. Sanitary or storm sewer lines:
 - a. Comply with requirements of Section 02722 and Section 02721.
 - b. Do not excavate trench more than 200' ahead of pipe laying, unless permitted by Engineer.
 - c. Maintain trench sides vertical to point not less than 2' above top of pipe.
 - d. Upper portion of trench may be sloped to any width which will not cause damage to adjoining structures, utilities, pavements or private property.
- P. Comply with pertinent OSHA regulations in regards to the excavation of utilities.

3.04 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.

3.05 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. Lower portion of trench:

1. Deposit approved backfill and bedding material in layers of 6" maximum thickness, and compact with suitable tampers to the density of the adjacent soil until there is a cover of not less than 24" over sewers and 12" over other utility lines.
 2. Take special care in backfilling and bedding operations not to damage pipe and pipe coatings.
- H. Remainder of trench:
1. Except for special materials for pavements, backfill the remainder of the trench with material free from stones larger than 6" 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.
- I. Under roads, streets and other paved areas:
1. Mechanically tamp in 6" layers using heavy duty pneumatic tampers or equal.
 2. Tamp each layer to a density equivalent of not less than 100% of an ASTM D 698 Proctor Curve.
 3. Provide additional compaction by leaving the backfilled trench open to traffic while maintaining the surface with crushed stone.
 4. Refill any settlement with crushed stone and continue such maintenance until replacement of pavement is authorized by the 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' 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. Correct areas that are over-excavated.
1. Other areas: Use general fill, flush to required elevation, compacted to minimum 95 percent of maximum dry density.
- O. 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.
- P. Reshape and re-compact fills subjected to vehicular traffic.

3.06 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. Over existing utilities within 12 inches where a conflict arises, cast in place concrete will be required between the conflicting utilities.
 5. Compact in maximum 8 inch (200 mm) lifts to 95 percent of maximum dry density.
- C. At Pipe Culverts:
1. Bedding: Use general fill.
 2. Place filter fabric specified in Section 33 0513 over compacted bedding.
 3. Cover with general fill.
 4. Fill up to subgrade elevation.

5. Compact in maximum 8 inch (200 mm) lifts to 95 percent of maximum dry density.

3.07 FIELD QUALITY CONTROL

- A. See Section 01 4000 - 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 D2922, or ASTM D3017.
- C. 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.
- D. If tests indicate work does not meet specified requirements, remove work, replace and retest.

3.08 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.

3.09 MEASUREMENT AND PAYMENT

- A. Unclassified excavation:
 1. No 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 utility line to which it pertains.

3.10 END OF SECTION

SECTION 02373
RIPRAP

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Riprap.
- B. 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 02316 - Backfill and Compaction.
- C. Section 02260 - Erosion and Sediment Control.

1.03 QUALITY ASSURANCE

- A. Perform Work in accordance with SCDOT 2007 Standard Specifications for Highway Construction.
- 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.

1.04 SUBMITTALS

- A. Comply with pertinent provisions of Section 01300.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Riprap: Broken stone, 6 inch (150 mm) minimum size, 12 inch (300 mm) maximum size; solid and nonfriable.
- B. Aggregate: Granular fill as specified in Section 02316.
- C. Filter Fabric
 - 1. Provide Mirafi 600X or approved equal.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Do not place riprap bags over frozen or spongy subgrade surfaces.

3.02 RIP-RAP PLACEMENT

- A. Place geotextile fabric over substrate, lap edges and ends.
- B. Place riprap at culvert pipe ends, embankment slopes, and as indicated.
- C. Where thickness is not shown on the plans, it shall be 12".
- D. 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.
- E. Properly compact depressions that may be filled in trimming and shaping the slope.
- F. Install filter fabric, lapping sides 12".
- G. Begin placing in a trench at least 2' below the toe of the slope.
- H. Firmly imbed against the slope and the adjoining piece with the sides in contact and with broken joints.
- I. Fill the spaces between the larger pieces with spalls of suitable size, thoroughly ram into place.

J. The finished surface shall present an even, tight surface true to line, grade and section.

3.03 MEASUREMENT AND PAYMENT

A. Payment will be made at the unit price per "Each" as stated in the Bid Form.

END OF SECTION

SECTION 02380
PERMANENT GEOSYNTHETIC TURF REINFORCEMENT MAT

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. This section specifies a permanent Geosynthetic Turf Reinforcement Mat (TRM) with Flexible Growth Medium (FGM) infill, to prevent long-term soil and vegetation loss resulting from excessive water flow (velocity and shear stress) in which unreinforced vegetation could not resist. The FGM provides immediate and temporary protection against movement and/or loss of soil until vegetation can be established. The FGM infill also provides an ideal environment for rapid seed germination and accelerated plant and root establishment within the matrix of the TRM.

1.2 RELATED SECTIONS

- A. Section 01 3000 - Administrative Requirements
- B. Section 01 7800 - Closeout Submittals
- C. Section 00 2260 - Erosion and Sediment Control.

1.3 PRICE AND PAYMENT PROCEDURES

- A. Unit Prices: See Section 01 2200 - Unit Prices, for additional unit price requirements.
 - 1. Measure Erosion and Sediment Control by the lump sum.

1.4 SUBMITTALS

- A. Warranty: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.
- B. Product Data: Submit manufacturer's product data and installation instructions. Include required substrate preparation, list of materials and application rate.
- C. Certifications: Manufacturer shall submit a letter of certification that the product meets or exceeds all physical property, endurance, performance and packaging requirements.

1.5 QUALITY ASSURANCE

- A. Designer Qualifications: Perform design under direct supervision of a Professional Civil Engineer experienced in design of this type of work and licensed in South Carolina.
- B. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than three years of documented experience.
- C. Copies of Documents at Project Site: Maintain at the project site a copy of each referenced document that prescribes execution requirements.
- A. Convene one week before starting work of this section.

1.6 DELIVERY, STORAGE, AND PROTECTION

- A. Deliver materials and products in UV and weather-resistant factory labeled packages. Store and handle in strict compliance with manufacturer's instructions and recommendations. Protect from damage, weather, excessive temperatures and construction operations

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. 2.01 Acceptable Manufactures
PROFILE Products LLC or approved equal
750 Lake Cook Road - Suite 440
Buffalo Grove, IL 60089
800-366-1180 (Fax 847-215-0577)
www.profileproducts.com
- B. Substitutions: Not permitted.

2.2 MATERIALS

- A. A. Turf Reinforcement Mat shall be Enkamat 7020, manufactured for the purpose of permanent channel lining and turf reinforcement. The TRM shall be made from 100% synthetic material and contain no biodegradable or photodegradable components or materials.
1. The TRM shall be a homogeneous, three dimensional matrix made of continuous monofilament yarns which are thermally fused at the crossover points to provide a structure that will maintain its three dimensional stability without laminated or stitched layers. No nettings or stitching shall be permitted. The TRM shall have a sufficient Area Holding Capacity and a minimum 95% open space available for soil, FGM and root interaction. The TRM shall not lose its structural integrity and shall not unravel or separate when TRM is cut in the field.
 2. The TRM shall exhibit no buoyancy factor (i.e., the specific gravity of the fibers used should be greater than 1.0) so as to allow the TRM to maintain intimate contact with the soil (particularly between fasteners) under low flow or submersed conditions.
 3. The TRM, when infilled with FGM, shall meet the property values noted.
- B. Flexible Growth Medium for hydraulic infill of TRM shall be Flexterra® FGM™ and conform to the property values as presented in the Flexterra data sheet.
- C. All components of the FGM shall be pre-packaged by the Manufacturer to assure material performance and in compliance with the following values. Under no circumstances will field mixing of additives or components be accepted.
1. Thermally Processed Wood Fibers 74.5% ± 3.5%
 2. Proprietary Crosslinked Hydro-Colloid Tackifiers and Activators 10% ± 1%
 3. Proprietary Crimped, Interlocking Fibers 5% ±1%
 4. Moisture Content 10.5% ± 1.5%

	Test Method	English	SI
PHYSICAL			
Mass Per Unit Area	ASTM D6566	19.5 oz/yd ²	661 g/m ²
Thickness	ASTM D6525	0.40 in	10 mm
Tensile Strength - MD	ASTM D6818	170 lb/ft	2.5 kN/m ²
Light Penetration	ASTM D6567	1.0%	1.0%

	Test Method	English	SI
PHYSICAL			
Ground Cover	ASTM D6567	99.0%	99.0%
Absorption	ASTM D1117	498.0%	498.0%
UV Resistance	ASTM D7238 & D6818	80.0%	80.0%
Bench Scale C-Factor(a) (average)	ASTM D7101	0.01	0.01
Resiliency	ASTM D6524	90.0%	90.0%
ENDUEANCE			
Functional Longevity (b)	Observed	>36 months	>36 Months
PERFORMANCE			
C-Factor	Large Scale(c)	0.01	0.01
Manning's n Range	ASTM D6460	0.022-0.045	0.022-0.04 5
Permissible Vegetated Shear	ASTM D6460	8.0 lb/ft ²	0.38 kN/m ²
Permissible Vegetated Velocity	ASTM D6460	16.0 ft/s	4.9 m/s
Permissible Unvegetated Shear	ASTM D6460	3.3 lb/ft ²	0.16 kN/m ²

Permissible Unvegetated Velocity	ASTM D6460	12.0 ft/s	3.7 m/s
Vegetation Establishment	ASTM D7322	800%	800%

- a. Functional longevity depends on moisture, light and environmental conditions.
- b. Cover Factor is calculated as soil loss ratio of treated surface versus an untreated control surface.
- c. Large scale testing conducted at Utah Water Research facility using rainfall simulator on 2.5H:1V slope, sandy-loam soil, at a rate of 5" per hour for a duration of 60 minutes.

PART 3 EXECUTION

3.1 PREPARATION

- A. The installation site shall be prepared by clearing, grubbing and excavation or filling the area to the design grade.
- B. The surface to receive the TRM shall be prepared to relatively smooth conditions free of obstructions, rocks, dirt clods, roots, stumps, depressions, debris and soft or low density pockets of material. The material shall be capable of supporting a vegetative cover.
- C. Erosion features such as rills, gullies, etc. must be graded out of the surface before TRM deployment. Smooth roll drum compaction will be required before deploying TRM to make sure the TRM makes immediate contact with the soil and to ensure that the soil has been compacted.
- D. Cut trenches for initial anchor trenches, termination trench and longitudinal anchor trenches (12 inches wide and 12 inches in depth) as shown on the drawings.

3.2 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Care shall be taken during installation to avoid damage occurring to the TRM as a result of the installation process. Should the TRM be damaged during installation, a TRM patch shall be placed over the damaged area extending 1 m (3.28 ft) beyond the perimeter of the damage.
- C. Install anchoring devices at a frequency of 2 1/2 pins/staples per square yard. Additional anchoring devices may be required depending on site conditions or alignment of the slope or channel. Always staple (1' centers) the seams between individual TRM rolls.
- D. When overlapping successive TRM rolls, the rolls shall be overlapped upstream over downstream and/or upslope over downslope.
- E. For channels, begin at the downstream end in the center of the channel. Inspect trenches for position accuracy and depth and re-dig to required dimensions. If trenches have not yet been constructed, dig initial anchor trenches, check slot trenches and longitudinal anchor trenches as illustrated in installation guidelines or as directed on the plans. Unroll approximately 10' of the TRM, positioning the roll face down (as it unrolls) over the initial anchor trench, extending several inches beyond the trench with the roll sitting on the down stream side of the anchor trench. Positioning roll in this manner permits backfilling and compaction of soil into the trench while allowing installer to proceed with proper deployment of TRM by unrolling upstream, over the anchor trench.
- F. Position second TRM with a minimum 4-inch overlap of the previous TRM and secure it into the anchor trench. After entire width area is installed with the TRM, then backfill and compact the anchor trench.
- G. Continue deploying TRM upstream to the next check slot. Overlay a minimum of 18 inches the ends of rolls with the next roll(s) being deployed, or position in bottom of check slot, anchor and backfill and compact check slots. Continue the processes until you reach the upstream starting point of the TRM.
- H. For slopes, construct top anchor trench 1-3' beyond crest of slope, or as illustrated in drawings or shown in manufacturers recommended installation guidelines. Position TRM roll at crest of

slope with sufficient material to line the entire anchor trench plus enough material left over to cover the trench. Position adjacent rolls to facilitate 6" overlaps. Anchor TRM in trench with appropriate pins/staples at 1' centers. Once several rolls are anchored in trench, begin to backfill and compact trench to original elevation. The preferred method of deploying roll down slope is to stand in front of the roll and pin it as it rolls out down the slope, minimizing foot traffic on TRM, which will eliminate depressions under the mat. Always allow the mat to drape over the soil, never pulling it taut, to minimize tenting. Place additional pins into any apparent depressions to maintain contact with the soil.

- I. Hydraulically fill the TRM with 0.35 inches of FGM, applied with hose at close range. Optimum application rate is 3500 lbs/acre or to the depth of where the tips of TRM are still exposed.
- J. Strictly comply with FGM manufacturer's installation instructions and recommendations. For optimum FGM pumping and application performance, use approved mechanically agitated, hydraulic seeding/mulching machines, hose of sufficient length to reach the TRM, use of a 50 degree tip/nozzle is highly recommended. Apply FGM from hose positioned over shoulder with nozzle approximately at chest level (48-60") to achieve optimum TRM infill.
- K. For optimum hydraulic performance and vegetative establishment, be careful not to overfill the TRM. The tips of the TRM shall be slightly exposed.
- L. Apply supplemental water over the area as directed by site personnel during germination and initial three months of vegetation growth.

3.3 CLEANING AND PROTECTION

- A. Clean spills promptly. Advise owner of methods for protection of treated areas. Do not allow treated areas to be trafficked or subjected to grazing.

END OF SECTION

SECTION 02620

SUBDRAINAGE

1.01 INFILTRATION TRENCH

- A. DESCRIPTION:** This section contains specifications for the materials, equipment, construction, measurement, and payment for the placement of infiltration trenches in conformity with the Plans and Specifications, SCDOT Stormwater Quality Design Manual – Appendix E, or as directed by the Engineer. The work shall consist of excavation of the trench, installation of sand filter, washed stone, perforated pipe (where specified on plans), geotextile fabric, observation well and construction of a Emergency Overflow Berm (where specified on plans).

Infiltration Trenches shall not be installed until after permanent stabilization has been achieved.

- B. MATERIALS:** Refer to the SCDOT Stormwater Quality Design Manual – Appendix E.
- C. EQUIPMENT:** Contractor to avoid using compaction equipment or driving construction equipment over Infiltration Trench.
- D. CONSTRUCTION:** Infiltration Trenches shall not be installed until after permanent stabilization has been achieved. A test pit shall be excavated at least 18" below the bottom of each Infiltration Trench to ensure no groundwater is present. If groundwater is witnessed within 18" of the bottom of an infiltration trench, contractor to notify Aiken County for approval of a new location. Infiltration Trench to be construction without the use of any compaction equipment. Contractor to avoid driving construction equipment over Infiltration Trench. Refer to the SCDOT Stormwater Quality Design Manual – Appendix E for more details.
- E. MEASUREMENT AND PAYMENT:** The payment for all newly installed Infiltration Trench will be measured and paid at the Contract Unit Price Bid per lineal foot. Payment will be full compensation for all removal and disposal applicable excavation, sheeting, shoring, dewatering, hauling, storing, rehandling of material, removal and disposal of excess and unsuitable material, forming bed, backfill and for all material, labor, equipment, tools, and incidentals necessary to complete the work.

2.01 CONTINGENT - PERFORATED PIPE UNDERDRAINS

- .A. DESCRIPTION:** This work shall consist of all labor, supervision, material, equipment and services necessary and incidental for installing new 6" perforated pipe underdrain. This item shall be used at locations and to the limits as marked in the field and/or as directed by the Engineer.
- B. MATERIALS:** Refer to the SCDOT 2007 Standard Specifications for Highway Construction Section 802.2 in its entirety.

- C. **EQUIPMENT:** Refer to the SCDOT 2007 Standard Specifications for Highway Construction Section 802.3 in its entirety.
- D. **CONSTRUCTION:** Refer to the SCDOT 2007 Standard Specifications for Highway Construction Section 802.4 in its entirety.
- E. **MEASUREMENT AND PAYMENT:** Contingent Pipe Underdrains will be measured and paid for at the Contract unit price bid per linear foot. The payment will be full compensation for all material, labor, equipment, tools, and incidentals necessary to complete the work.

END OF SECTION

**SECTION 02635
STORM DRAINAGE PIPING**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Storm drainage piping, fittings, and accessories.

1.02 RELATED REQUIREMENTS

- A. Section 31 2316 - Excavation: Excavating of trenches.
- B. Section 31 2316.13 - Trenching: Excavating, bedding, and backfilling.
- C. Section 31 2323 - Fill: Bedding and backfilling.
- D. Section 03 3000 - Cast-in-Place Concrete: Concrete for cleanout base pad construction.

1.03 REFERENCE STANDARDS

- A. ASTM C76 - Standard Specification for Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe; 2010.
- B. ASTM C76M - Standard Specification for Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe [Metric]; 2010.
- C. ASTM C443 - Standard Specification for Joints for Concrete Pipe and Manholes, Using Rubber Gaskets; 2005a.
- D. ASTM C443M - Standard Specification for Joints for Circular Concrete Sewer and Culvert Pipe, Using Rubber Gaskets (Metric); 2007.

1.04 SUBMITTALS

- A. See Section 01300 - Administrative Requirements, for submittal procedures.

PART 2 PRODUCTS

2.01 STORM SEWER PIPE MATERIALS

- A. Concrete Pipe Joint Devices: ASTM C443 (ASTM C443M) rubber compression gasket joint.
- B. Concrete Pipe: Reinforced, ASTM C 76 (ASTM C 76M), Class V with Wall type A; mesh reinforcement; inside nominal diameter as specified, bell and spigot end joints. Contractor may propose use of lower class pipe if more cover can be established. Backfill shall comply with all applicable specifications of the most current SCDOT Standard Specifications for Highway Construction Section 719.4.8 unless otherwise instructed by the Engineer. Concrete Mix shall comply with all applicable specifications of the most current SCDOT Standard Specifications for Highway Construction Division 700 unless otherwise instructed by the Engineer.
- C. Reinforced Concrete Pipe Joint Device: ASTM C443 (ASTM C443M) rubber compression gasket joint.

2.02 PIPE ACCESSORIES

2.03 CATCH BASIN, JUNCTION BOX, CLEANOUT, AND AREA DRAIN COMPONENTS

- A. Lids and Drain Covers: As specified on the details on the plans.
- B. Base Pad: Cast-in-place concrete of type specified in Section 03 3000, levelled top surface to receive concrete shaft sections, sleeved to receive storm sewer pipe sections.

PART 3 EXECUTION

3.01 TRENCHING

- A. See Section 02317 for additional requirements.
- B. Backfill around sides and to top of pipe with cover fill, tamp in place and compact, then complete backfilling.

3.02 INSTALLATION - PIPE

- A. Install pipe, fittings, and accessories in accordance with manufacturer's instructions. Seal watertight.
- B. Lay pipe to slope gradients noted on layout drawings; with maximum variation from true slope of 1/8 inch (3 mm) in 10 feet (3 m).
- C. Connect to building storm drainage system, foundation drainage system, and utility/municipal sewer system.

3.03 INSTALLATION - CATCH BASINS 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 storm sewer pipe end sections.
- C. Establish elevations and pipe inverts for inlets and outlets as indicated.
- D. Mount lid and frame level in grout, secured to top cone section to elevation indicated.

3.04 FIELD QUALITY CONTROL

- A. If tests indicate Work does not meet specified requirements, remove Work, replace and retest at no cost to Aiken County.

3.05 PROTECTION

- A. Protect pipe and bedding cover from damage or displacement until backfilling operation is in progress.

3.06 MEASUREMENT AND PAYMENT

- A. All work under this Section will be measured and paid for as specified hereinafter.
 - 1. All Storm Drainage Piping shall be measured and paid for by linear foot unless specified on the Drawings.

END OF SECTION

**SECTION 02701
GRADED AGGREGATE BASE COURSE**

- 1.01 DESCRIPTION:** Refer to the SCDOT 2007 Standard Specifications for Highway Construction Section 305.1 in its entirety. This work shall consist of all materials, equipment, and labor required to construct a base course on a properly prepared foundation in conformance with the Plans or as directed by the Engineer. Prime Coat shall be used unless otherwise directed by the Engineer.
- 2.01 MATERIALS:** Refer to the SCDOT 2007 Standard Specifications for Highway Construction Section 305.2 in its entirety and the following:
- A. Use graded aggregate base material such as Macadam Base, Marine Limestone Base, Recycled Portland Cement Base, or other graded aggregate base that conforms to the requirements of SCDOT Standard Specification 305.2. The selected base material shall be approved by the engineer prior to placement.
 - B. For Asphalt Prime Coat, use EA-P Special for priming the base course conforming to the requirements of SCDOT Standard Specification 407.2.4 paragraph 2.
- 3.01 EQUIPMENT:** Refer to the SCDOT 2007 Standard Specifications for Highway Construction Section 305.3 in its entirety.
- 4.01 CONSTRUCTION:** Refer to the SCDOT 2007 Standard Specifications for Highway Construction Section 305.4 in its entirety.
- 5.01 MEASUREMENT AND PAYMENT:** This item shall be measured and paid for at the contract unit price per Square Yard. Refer to the SCDOT 2007 Standard Specifications for Highway Construction Section 305.5 and 305.6 in its entirety. Prime Coat will not be measured and paid for, but shall be considered incidental to the placement of graded aggregate base course.

END OF SECTION

SECTION 02741
ASPHALTIC CONCRETE PAVING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Single course asphaltic concrete paving.

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 02701 -: 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; 1994.
- B. AI MS-19 - A Basic Asphalt Emulsion Manual; The Asphalt Institute; Third 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 SCDOT 2007 Standard Specifications for Highway Construction.
- B. Mixing Plant: Conform to SCDOT 2007 Standard Specifications for Highway Construction.
- 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 SUBMITTALS

- A. Comply with pertinent provisions of Section 01340.

1.06 PRODUCT HANDLING

- A. Comply with pertinent provisions of Section 01600.

1.07 FIELD CONDITIONS

- A. Do not place asphalt when ambient air or base surface temperature is less than 40 degrees F (4 degrees C) in the shade and falling, or below 35°F 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 (8 C degrees) below bitumen supplier's bill of lading and not more than maximum specified temperature.

PART 2 PRODUCTS

2.01 MATERIALS

- A. All Materials: In accordance with SCDOT 2007 Standard Specifications for Highway Construction. SCDOT TYPE C Asphalt.

2.02 ASPHALT PAVING MIXES AND MIX DESIGN

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 C Mix".
- B. Provide hot plant mixed asphaltic concrete paving materials.
 - 1. Temperature leaving the plant: 290°F minimum, 320°F maximum.

2. Temperature at time of placing: 280°F 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 C Mix."
- B. Provide hot plant mixed asphaltic concrete paving materials.
 1. Temperature leaving the plant: 290°F minimum, 320°F maximum.
 2. Temperature at time of placing: 280°F 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 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.

3.02 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" above the edges of these structures.

3.03 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.

3.04 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 1/4 gal/sq yd .
- C. Apply tack coat to contact surfaces as required per SCDOT or as specified on the drawings.

3.05 PLACING ASPHALT PAVEMENT - SINGLE COURSE

- A. Install Work in accordance with State of SCDOT Highways standards.
- B. Place asphalt within 24 hours of applying primer or tack coat.

- C. Compact pavement by rolling to specified density. Do not displace or extrude pavement from position. Hand compact in areas inaccessible to rolling equipment.
- D. Perform rolling with consecutive passes to achieve even and smooth finish without roller marks.

3.06 TOLERANCES

- A. Free from Bird Baths.

3.07 FIELD QUALITY CONTROL

- A. See Section 01 4000 - Quality Requirements, for general requirements for quality control.
- B. 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" in 6', 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.

3.08 PROTECTION

- A. Allow no traffic on surface until the mixture has hardened sufficiently to prevent distortion.

3.09 MEASUREMENT AND PAYMENT

- A. Measurement of length and width of paved areas will be made.
- B. Payment will be made at the unit price per square yard as stated in the Bid Form.

END OF SECTION

SECTION 02760

PAVEMENT SPECIALTIES

1.01 24" WHITE THERMOPLASTIC STOP BAR

- A. **DESCRIPTION:** This work shall consist of furnishing and installing 24" White Thermoplastic Stop Bars at locations and to the limits as marked in the field, listed herein and/or as directed by the Engineer. This work shall include all materials, equipment, labor and incidentals necessary to complete the work.
- B. **MATERIALS:** Refer to the SCDOT 2007 Standard Specifications for Highway Construction Section 627.2 in its entirety.
- C. **EQUIPMENT:** Refer to the SCDOT 2007 Standard Specifications for Highway Construction Section 627.3 in its entirety.
- D. **CONSTRUCTION:** Refer to the SCDOT 2007 Standard Specifications for Highway Construction Section 627.4 in its entirety.
- E. **MEASUREMENT AND PAYMENT:** 24" White Thermoplastic Stop Bars will be measured and paid for at the Contract unit price bid per lineal foot. The payment will be full compensation for all material, labor, equipment, tools, and incidentals necessary to complete the work.

2.01 4" WHITE SOLID LINE, THERMOPLASTIC PAVEMENT MARKING

- A. **DESCRIPTION:** This work shall consist of furnishing and installing 4 inch wide white thermoplastic lines to be used for pavement markings. This item shall be used at locations and to the limits as marked in the field, listed herein, and/or as directed by the Engineer. This work shall include all materials, equipment, labor and incidentals necessary to complete the work.
- B. **MATERIALS:** Refer to the SCDOT 2007 Standard Specifications for Highway Construction Section 627.2 in its entirety.
- C. **EQUIPMENT:** Refer to the SCDOT 2007 Standard Specifications for Highway Construction Section 627.3 in its entirety.
- D. **CONSTRUCTION:** Refer to the SCDOT 2007 Standard Specifications for Highway Construction Section 627.4 in its entirety.
- E. **MEASUREMENT AND PAYMENT:** Lines will be measured and paid for at the Contract unit price bid per lineal foot (LF). The payment will be full compensation for all material, labor, equipment, tools, and incidentals necessary to complete the work.

3.01 RAISED PAVEMENT MARKERS

- A. **DESCRIPTION:** This work shall consist of installing new raised pavement markers (RPMs) at approximately 80-feet along the centerline of the final pavement surface. In curves, RPMs will be placed at 40-feet on center.
- B. **MATERIALS:** Refer to the SCDOT 2007 Standard Specifications for Highway Construction Section 630.2 in its entirety.
- C. **EQUIPMENT:** Refer to the SCDOT 2007 Standard Specifications for Highway Construction Section 630.3 in its entirety.
- D. **CONSTRUCTION:** Refer to the SCDOT 2007 Standard Specifications for Highway Construction Section 630.4 in its entirety.
- E. **MEASUREMENT AND PAYMENT:** Raised Pavement Markers will be measured and paid for at the Contract unit price bid per each. The payment will be full compensation for all material, labor, equipment, tools, and incidentals necessary to complete the work. Payment for removal of existing RPMs will be considered incidental to the cost of this item.

END OF SECTION

**SECTION 02821
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 33 7900 – Site Grounding.
- C. Section 08 7100 – Door Hardware: Gate locking device.

1.03 PRICE AND PAYMENT PROCEDURES

- A. Fences will be provided by the unit price method.
- B. Fencing: Measurement and payment by the linear foot, to the existing fence height and material type, based on the existing specified post spacing. Includes posts, rails, tension wire, fabric, accessories, attachments.
- C. Post Footings: Measurement and payment by each unit of footing, shall be incidental to Fencing.

1.04 REFERENCE STANDARDS

- A. ASTM A121 – Standard Specification for Metallic-Coated Carbon Steel Barbed Wire; 2007.
- B. ASTM A123/A123M – Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2009.
- 1. 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; 2007.
- E. ASTM A428/A428M – Standard Test Method for Weight (Mass) of Coating on Aluminum-Coated Iron or Steel Articles; 2006.
- F. ASTM A491 – Standard Specification for Aluminum-Coated Steel Chain-Link Fence Fabric; 2007.
- G. 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; 2009b
- H. ASTM C94/C94M – Standard Specification for Ready-Mixed Concrete; 2009a.
- I. ASTM F567 – Standard Practice for Installation of Chain-Link Fence; 2007.
- J. ASTM F1043 – Standard Specification for Strength and Protective Coatings on Steel Industrial Chain Link Fence Framework; 2008.
- K. ASTM F1083 – Standard Specification for Pipe, Steel, Hot-Dipped Zinc-Coated (Galvanized) Welded, for Fence Structures; 2008.
- L. ASTM F 537-01: Standard Specification for Design, Fabrication and Installation of Fences Constructed of Wood and Related Materials
- M. ASTM C5: Fence Post, Preservative Treatment by Pressure Process
- N. ASTM F1222: Classification for Hardware for Wood Fencing
- O. ASTM M4: Care of Pressure Treated Wood Products
- P. ASTM TT-W-572B: Wood Preservative: Water Repellent

Q. 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, fence material, posts, accessories, fittings, stains, coatings, locks and hardware.
- C. Shop Drawings: Indicate plan layout, spacing of components, post foundation dimensions, hardware anchorage, approval of property owner, and schedule of components. The material type should match the existing fencing to be removed and approved by the adjacent property owner prior to submittal.

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 EXECUTION

2.01 TOLERANCES

- A. Maximum Variation From Plumb: ¼ inch (6 mm).
- B. Maximum Offset From True Position: 1 inch (25 mm).
- C. Components shall not infringe adjacent property lines.

2.02 MEASUREMENT AND PAYMENT

- A. Measurement or direct payment will be made for this work under this section at the Unit Price "per Linear Foot" as stated in the Bid Form.

END OF SECTION

SECTION 02890

TRAFFIC SIGNS

1.01 SIGNS

- A. **DESCRIPTION:** Refer to the SCDOT 2007 Standard Specifications for Highway Construction Section 605.1 in its entirety. The work consists of erecting these signs at the locations shown on plans.
- B. **MATERIALS:** Refer to the SCDOT 2007 Standard Specifications for Highway Construction Section 605.2 in its entirety.
- C. **EQUIPMENT:** Refer to the SCDOT 2007 Standard Specifications for Highway Construction Section 605.3 in its entirety.
- D. **CONSTRUCTION:** Refer to the SCDOT 2007 Standard Specifications for Highway Construction Section 605.4 and more specifically Section 605.4.1.3 in its entirety.
- E. **MEASUREMENT AND PAYMENT:** The quantity for Flat Sheet Signs (mounted as required) is per each of the signs installed. The payment will be full compensation for installing flat sheet signs as specified or directed and includes providing, storing, installing, relocating as necessary, and maintaining the signs. Payment includes providing an approved sign substratum with the proper sheeting and legend; erecting the signs on ground-mounted 3-pound per foot U-section posts, providing approved permanent sign supports or customized mounting hardware; providing approved breakaway assemblies and necessary customized mounting hardware; and all other materials, labor, hardware, equipment, tools, supplies, transportation, incidentals; miscellaneous items necessary for installation and maintenance of the signs until completion of the work.

END OF SECTION

**SECTION 02921
GRASSING**

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, Section – Section 00700 General Conditions of these Specifications.
- B. Section 02316 – Fill and Backfill
- C. Section 02260 – Erosion and Sediment Control

1.03 PRICE AND PAYMENT PROCEDURES

- A. See Bid Form; for additional unit price requirements.

1.04 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.

1.05 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.
 - 2. Fertilizer: Conform to State fertilizer law.

1.06 SUBMITTALS

- A. See Section 01300 – Administrative Requirements, for submittal procedures.
- B. Comply with pertinent provisions of Section 01300.
- 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)

1.07 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 01600 – 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 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
 - a. Water: Clean, fresh and free of substances that could inhibit vigorous growth of grass.
 - B. Stakes: Softwood lumber, chisel pointed
 - c. String: inorganic fiber
 - d. 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 NeutralLime® 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.
 - 4) Wood Fiber Mulch
 - (a) 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.
 - (b) Material shall contain thermally processed wood fibers so as to contain no germination or growth inhibiting factors and to achieve phyto-sanitization.
 - © Material shall contain basic green dye to facilitate visual metering.
 - 5) Flexterra HP-FGM
 - (a) Provide Flexterra HP-FGM® as manufactured by Profile Products.
 - (b) Material shall contain thermally refined wood fibers and crimped synthetic fibers so as to contain no germination or growth inhibiting factors.
 - © Materials shall contain non-toxic green dye to facilitate metering.
 - (d) Material shall be 100% Bio-degradable.
 - 6) Straw Mulch/Dry Applied Mulching Pellets
 - (a) Provide straw or hay material.
 - (1) Straw to be stalks of wheat, rye, barley or oats.
 - (2) Hay to be timothy, peavine, alfalfa, or coastal Bermuda
 - (b) 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.
 - © 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.
 - 7) Erosion Control Blanket
 - (a) Provide on areas as shown on the plans
 - (b) 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 01400 – 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 clean up operations.
 - 1. Slopes greater than 4:1
 - 2. Utility right-of-ways or any other disturbed area adjacent to wetlands.
 - a. Bring all areas to proper line, grade and cross section indicated on the plans.
 - B. Repair erosion damage prior to commencing seeding operations.
 - c. 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.
 - d. 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.
 - A. 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.
 - 1) 25% Hulled Sahara Bermudagrass
 - 2) 25% Unhulled Sahara Bermudagrass
 - 3) 25% Pensacola Bahiagrass

- 4) 10% Durana White Clover
- 5) 10% Brown Top Millet
- 6) 5% Weeping Lovegrass
 - (a) Rate 75 LBS/ACRE or 1.75 LBS/1000 sq. ft.
 - (b) Seed to be coated with MYCO Advantage by Pennington Seed, Inc.
 - © Contact: Pennington Seed, Inc., 1236 Eden Street, Columbia, SC 29201 – Jay Sprague – 803-608-5963
 - (1) Schedule No. 2 – Planting Dates September 15 – March 31: (2) Slopemaster Fall/Winter Mix by Pennington Seed, Inc.
 - (3) 25% Unhulled Sericea Lespedeza
 - (4) 20% Unhulled Sahara Bermudagrass
 - (5) 20% Greystone Tall Fescue
 - (6) 10% Pensacola Bahiagrass
 - (7) 10% Durana White Clover
 - (8) 10% Rye Grain
 - (9) 5% Weeping Lovegrass
 - (10) Rate 100 LBS/ACRE or 2.25 LBS/1000 sq. ft.
 - (11) Seed to be coated with MYCO Advantage by Pennington Seed, Inc.
 - (12) Contact: Pennington Seed, Inc., 1236 Eden Street, Columbia, SC 29201 – Jay Sprague – 803-608-5963
- 7) Permanent Seeding Mix – Slopes 4:1 or Less
 - (a) Schedule No. 1 – Planting Dates April 1 – September 15: (1) Hulled Sahara® Bermudagrass
 - (2) Rate 75 LBS/ACRE or 1.75 LBS/1000 sq. ft.
 - (3) Schedule No. 2 – Planting Dates September 15 – March 31: (4) Unhulled Sahara Bermudagrass
 - (5) Rate 100 LBS/ACRE or 2.25 LBS/1000 sq. ft.
- 8) Temporary Seeding Mix – All Disturbed Areas
- 9) 1. Schedule No. 1 – Planting Dates April 1 – September 15: (a) Brown Top Millet
 - (1) Rate 45 LBS/ACRE or 1 LBS/1000 sq. ft.
 - (2) 2. Schedule No. 2 – Planting Dates September 15 – March 31: (3) Rye Grain
 - (4) Rate 80 LBS/ACRE or 2 LBS/1000 sq. ft.
- 10) Do not seed areas in excess of that which can be mulched on same day.
- 11) Do not sow during rain, when the ground is too dry, or during windy periods.
- 12) Immediately following seeding and compacting, apply mulch to a thickness of 1/8 inches (3 mm). Maintain clear of shrubs and trees.
- 13) Apply water with a fine spray immediately after each area has been mulched. Saturate to 4 inches (100 mm) of soil.
- 14) 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.
 - a. 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.
- © 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.
 - (1) Hydraulic Seeding:
 - (2) Apply seed, fertilizer, lime, and wood fiber mulch using hydraulic equipment.
 - (3) 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.
 - (4) Minimum capacity of slurry tank: 1000 gallons.
 - (5) 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.
 - (6) 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.
 - (7) Apply slurry in two directions so as to avoid "shadowing."
 - (8) Use color of fiber mulch as guide, spraying the prepared seed bed until a uniform visible coat is obtained.
- 3) Seeding, slopes greater than four horizontal to one vertical:
 - (a) Seeding of slopes of 4:1 or greater will be done in one of the following two ways
 - (b) Dry Seeding:
 - (1) Sow seed not more than 24 hours after application of fertilizer and lime.
 - (2) 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.
 - (3) Cover seed and lightly compact with culti-packer if seed drill does not.
 - (4) 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.
 - (5) Hydraulic Seeding:
 - (6) Apply seed, fertilizer, lime, and Flexterra HP-FGM mulch using hydraulic equipment.
 - (7) 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.
 - (8) Minimum capacity of slurry tank: 1000 gallons.
 - (9) Apply Flexterra HP FGM, as defined in Section 2.01, at a rate of 3000 LBS/ACRE or 68 LBS/1000 sq. ft.
 - (10) 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.
 - (11) Apply slurry in two directions so as to avoid "shadowing."
 - (12) 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.

1. Control growth of weeds. Apply herbicides in accordance with manufacturer's instructions. Remedy damage resulting from improper use of herbicides.
 - D. 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.
 - E. Protect seeded areas with warning signs during maintenance period.
 - F. Maintain all seeded areas in satisfactory condition until final acceptance of Work.
 - G. Repair any eroded areas.
 - H. 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 as temporary seeding is incidental to "erosion and sediment control".

3.08 MEASURE AND PAYMENT

- A. Measurement and payment will be made for work under the Section at the Unit Price per "acre" as stated in the Bid Form.

END OF SECTION