3.3 PROJECT MEETINGS

A. Attendance:

1. To the maximum extent practicable, assign the same person or persons to represent the Contractor at project meetings throughout progress of the Work.
2. Subcontractors, materials suppliers, and others may be invited to attend those project meetings in which their aspect of the Work is involved.

B. Minimum agenda:

1. Review, revise as necessary, and approve Minutes of previous meetings.
2. Review progress of the Work since last meeting, including status of submittals for approval.
3. Identify problems that impede planned progress.
4. Develop corrective measures and procedures to regain planned schedule.
5. Complete other current business.

C. Revisions to Minutes:

1. Unless published Minutes are challenged in writing prior to the next regularly scheduled progress meeting, they will be accepted as properly stating the activities and decisions of the meeting.
2. Persons challenging published Minutes shall reproduce and distribute copies of the challenge to all Minutes.
3. Challenge to Minutes shall be settled as priority portion of "old business" at the next regularly scheduled meeting.

END OF SECTION

SECTION 01310

CONSTRUCTION SCHEDULES

PART 1 - GENERAL

1.1 DESCRIPTION

A. Work included: To assure adequate planning and execution of the Work so that the Work is completed within the number of calendar days allowed in the Contract, and to assist the Owner in appraising the reasonableness of the proposed schedule and in evaluating progress of the Work, prepare and maintain the schedules and reports described in this Section.

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. Requirements for progress schedule: General Conditions.
3. Construction period: Form of Agreement.

C. Definitions: "Day", as used throughout the Contract unless otherwise stated, means calendar day.

1.2 QUALITY ASSURANCE

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

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

C. Reliance upon the approved schedule:

1. The construction schedule as approved by the Owner will be an integral part of the Contract and will establish interim completion dates for the various activities under the Contract.
2. Should any activity not be completed within 15 days after the stated scheduled date, the Owner shall have the right to require the Contractor to expedite completion of the activity by whatever means the Owner deems appropriate and necessary, without additional compensation to the Contractor.
3. Should any activity be 30 days or more behind schedule, the Owner shall have the right to perform the activity or have the activity performed by whatever method the Owner deems appropriate.
4. Costs incurred by the Owner and by the Engineer in connection with expediting construction activity shall be reimbursed by the Contractor.
5. It is expressly understood and agreed that failure by the Owner to exercise the option either to order the Contractor to expedite an activity or to expedite the activity by other means shall not be considered to set a precedent for any other activities.

1.3 SUBMITTALS

A. Comply with pertinent provisions of Section 01340.

B. Preliminary analysis: Within 10 calendar days after the Contractor has received the Notice to Proceed, submit one reproducible copy and four prints of a preliminary construction schedule prepared in accordance with Part 3 of this Section.

C. Construction schedule: Within 10 calendar days after the Contractor has received the Owner's approval to revisions of a preliminary construction schedule, submit one reproducible copy and four prints of a construction schedule prepared in accordance with Part 3 of this Section.

D. Periodic reports: On the first working day of each month following the submittal described in Paragraph 1.3.C above, submit four prints of the construction schedule updated as described in Part 3 of this Section.

PART 2 - PRODUCTS

2.1 CONSTRUCTION ANALYSIS

A. Graphically show by bar chart the order and interdependence of all activities necessary to complete the work, and the sequence in which each activity is to be accomplished, as planned by the Contractor and his project field superintendent in coordination with all subcontractors whose work is shown on the diagram.

1. Provide two line bar chart; one for planned activity, and one for actual completion.

B. Include, but do not necessarily limit indicated activities to:

1. Project mobilization.
2. Submittal and approval of shop drawings and samples.
3. Procurement of equipment and critical materials.
4. Fabrication of special material and equipment, and its installation and testing.
5. Final cleanup.
6. Final inspecting and testing.
7. All activities by the Engineer that affect progress, required dates for completion, or both, for all and each part of the Work.

PART 3 - EXECUTION

3.1 PRELIMINARY ANALYSIS

A. Contents:

1. Show all activities of the Contractor under this Work for the period between receipt of Notice to Proceed and submittal of construction schedule.
2. Show the Contractor's general approach to remainder of the Work.
3. Show cost of all activities scheduled for performance before submittal and approval of the construction schedule.

3.2 CONSTRUCTION SCHEDULE

A. Provide a construction schedule incorporating all revisions from review of the preliminary analysis.

3.3 PERIODIC REPORTS

A. Provide monthly updates of the approved construction schedule.

1. Indicate "actual" progress for each activity on the bar chart.
2. Provide written narrative summary of revisions causing delay in the program, and an explanation of corrective actions taken or proposed.

3.4 REVISIONS

A. Make periodic revisions to the schedule to incorporate delays, early completion, etc.

B. Make only those revisions to approved construction schedule as are approved in advance by the Owner.

END OF SECTION

SECTION 01340

SHOP DRAWINGS, PRODUCT DATA AND SAMPLES

PART 1 - GENERAL

1.1 DESCRIPTION

A. Work included: Make submittals required by the Contract Documents and revise and resubmit as necessary to establish compliance with the specified requirements.

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. Individual requirements for submittals also may be described in pertinent sections of these specifications.

C. Work not included:

1. Unrequired submittals will not be reviewed by the Engineer.
2. The Contractor may require his subcontractors to provide drawings, setting diagrams, and similar information to help coordinate the work, but such data shall remain between the Contractor and his subcontractors and will not be reviewed by the Engineer.

1.2 QUALITY ASSURANCE

A. Coordination of submittals:

1. Prior to each submittal, carefully review and coordinate all aspects of each item being submitted.
2. Verify that each item and the submittal for it conform in all respects with the specified requirements.
3. By affixing the Contractor's signature to each submittal, certify that this coordination has been performed.
4. Review and coordinate each Shop Drawing or Sample with other Shop Drawings and Samples and with the requirements of the Work and the Contract Documents.
4. All submittals will have their appropriate Specification Section as noted. Any submittals not accompanied with their Section numbers will be returned to the Contractor.

B. Completeness of submittal:

1. Data shown on the Shop Drawings will be complete with respect to quantities, dimensions, specified performance and design criteria, materials, and similar data to show Engineer the services, materials, and equipment Contractor proposes to provide and to enable Engineer to review the information for the limited purposes.
2. Determine and verify all information relative to Contractor's responsibilities for means, methods, techniques, sequences, and procedures of construction, and safety precautions and programs incident thereto.

C. "Or equal":

1. 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.
2. The decision of the Engineer shall be final.

D. The Engineer shall assume that no shop drawing or related submittal comprises a variation unless the Contractor advises the Engineer otherwise in writing.

1.3 SUBMITTALS

A. Within fifteen (15) calendar days after the Contractor has received the Owner's notice to proceed, submit:

1. Schedule for submittals including specification section, type of submittal and submittal date.
2. Construction schedule.
3. Schedule of partial payment requests.

B. Make submittals of shop drawings, samples, substitution requests and other items in accordance with the provisions of this Section.

C. All submittals will have all applicable specification sections referenced clearly or they will be returned to the contractor for clarification.

PART 2 - PRODUCTS

2.1 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. Large prints (11" x 17" or larger):

1. Submit shop drawings in the form of white copies.
2. Blueprints will not be acceptable.

C. 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 four copies of electrical and three copies of all other submittals which will be retained by the Engineer.

D. Number of copies:

1. Submit the number of copies which are required to be returned, plus three copies which will be retained by the Engineer.
2. Electrical shop drawings: submit the number of copies which are required to be returned, plus four copies which will be retained by the Engineer.

E. Do not begin fabrication of equipment or materials prior to Engineer's approval of shop drawings.

2.2 VARIATIONS

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

B. Provide an explanation of why the item(s) submitted are considered to be equal to the item(s) specified.

C. Failure to submit a written notice will result in rejection of the submittal.

2.3 SAMPLES

A. Provide sample or samples identical to the precise article proposed to be provided. Identify as described under "Identification of submittals" below.

B. Number of samples required:

1. Unless otherwise specified, submit samples in the quantity which is required to be returned, plus one which will be retained by the Engineer.
2. By prearrangement in specific cases, a single sample may be submitted for review and, when approved, be installed in the work at a location agreed upon by the Engineer.

2.4 COLORS AND PATTERNS

A. Unless the precise color and pattern is specifically called out in the Contract Documents, and whenever a choice of color or pattern is available in the specified products, submit accurate color and pattern charts to the Engineer for selection.

PART 3 - EXECUTION

3.1 CONTRACTOR'S REVIEW OF SUBMITTALS

A. Before submitting a shop drawing or any related material, Contractor shall:

1. Determine and verify all field measurements, quantities, dimensions, specified performance and design criteria, installation requirements, materials, catalog numbers, and similar information with respect thereto.
2. Determine and verify the suitability of all materials with respect to intended use, fabrication, shipping, handling, storage, assembly, and installation pertaining to the performance of the Work
3. 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.
4. Approve each such submission before submitting it.
5. Stamp and sign each such submission before submitting it.

B. Shop drawings and related materials shall be returned with comments provided that each submission has been specified and is stamped by the Contractor.

C. Shop drawings or material not specified or which have not been approved by the Contractor shall be returned without comment.

D. Contractor is to utilize the following stamp on all shop drawing submittals:

This shop drawing has been reviewed by [***NAME OF CONTRACTOR***] and approved with respect to the means, methods, techniques, sequences, and procedures of construction, and safety precautions and programs incidental thereto. [***NAME OF CONTRACTOR***] also warrants that this shop drawing complies with contract documents and comprises no variations thereto.
By: _____
Date: _____

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

3.2 IDENTIFICATION OF SUBMITTALS

A. 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.

B. Accompany each submittal with a letter of transmittal showing all information required for identification and checking.

C. 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.

D. 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.

3.3 GROUPING OF SUBMITTALS

A. 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.

1. Partial submittals may be rejected as not complying with the provisions of the Contract.
2. The Contractor may be held liable for delays so occasioned.

3.4 TIMING OF SUBMITTALS

A. 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.

B. In scheduling, allow at least twenty-five working days for review by the Engineer following his receipt of the submittal.

3.5 RESUBMITTAL SCHEDULE

A. For submittals marked "Furnish as Corrected" by the Engineer, resubmittal shall be within fourteen (14) days of the review date shown on the Engineer's shop drawing review stamp.

B. For submittals marked "Revise and Resubmit", "Submit Specified Item", or "Rejected", resubmittal shall be within seven (7) days of the review date shown on the Engineer's shop drawing review stamp.

3.6 ENGINEER'S REVIEW

A. Review by the Engineer does not relieve the Contractor from responsibility for errors which may exist in the submitted data.

B. Engineer will provide timely review of Shop Drawings and Samples in accordance with the Schedule of Submittals acceptable to Engineer.

C. Engineer's review and approval will be only to determine if the items covered by the submittals will, after installation or incorporation in the Work, conform to the information given in the Contract Documents and be compatible with the design concept of the completed Project as a functioning whole as indicated by the Contract Documents.

D. Engineer's review and approval will not extend to means, methods, techniques, sequences, or procedures of construction (except where a particular means, method, technique, sequence, or procedure of construction is specifically and expressly called for by the Contract Documents) or to safety precautions or programs incident thereto.

E. The review and approval of a separate item as such will not indicate approval of the assembly in which the item functions.

F. Revisions:

1. Make revisions required by the Engineer.
2. If the Contractor considers any required revision to be a change, he shall so notify the Engineer as provided for in the General Conditions.
3. Make only those revisions directed or approved by the Engineer.
4. Submittals which have been reviewed and returned to the Contractor marked "Revise and Resubmit" or "Rejected" and which are resubmitted and not in an approvable 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.

END OF SECTION

SECTION 01410

TESTING LABORATORY SERVICES

PART 1 - GENERAL

1.1 DESCRIPTION

A. Work included:

1. Cooperate with the Owner's selected testing agency and all others responsible for testing and inspecting the work.
2. 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.

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. Requirements for testing may be described in various Sections of these specifications.
3. 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.

C. Work not included:

1. Selection of testing laboratory: The Owner will select a prequalified independent testing laboratory.
2. 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.
3. Tests at point of manufacture as specified in other Sections of these documents are to be made with all costs borne by the Contractor.

1.2 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.

1.3 PRODUCT HANDLING

A. Comply with pertinent provisions of Section 01640.

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

2.1 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.

2.2 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.

2.3 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

3.1 COOPERATION WITH TESTING LABORATORY

A. 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.

3.2 TAKING SPECIMENS

A. 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.

3.3 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.

END OF SECTION

SECTION 01500

TEMPORARY FACILITIES

PART 1 - GENERAL

1.1 DESCRIPTION

A. Work included: Provide temporary facilities needed for the work including, but not necessarily limited to:

1. Job box for the Contractor's and Engineer's personnel.
2. Sanitary facilities.

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.

1.2 PRODUCT HANDLING

A. Maintain temporary facilities in proper and safe condition throughout progress of the work.

1.3 QUALITY CONTROL

A. Provide a temporary job box for paperwork to be kept on site. The Engineer will approve of the box and its installed location.

1.4 SUBMITTALS

A. Comply with pertinent provisions of Section 01340.

B. Product data: Within 15 calendar days after the Contractor has received the Owner's Notice to Proceed, submit:

1. Materials list of items proposed under this Section.
2. Proposed location of job box.

PART 2 - PRODUCTS

2.1 FACILITIES

A. Sanitary facilities:

1. Provide temporary sanitary facilities in the quantity required for use by all personnel.
2. Maintain in a sanitary condition at all times.
3. Strictly enforce their use.

2.2 TEMPORARY FENCING

A. Contractor shall provide temporary fencing around entire site construction area as directed by the Owner. Contractor will directly coordinate with Owner.

B. Fencing shall be minimum 6' high chain link, seamlessly connected and adequately anchored to the ground so that unauthorized persons cannot pass through.

C. Maintain a secure perimeter around all active work areas.

D. Make repairs as necessary to maintain secure perimeter, to satisfaction of Owner and Engineer at no additional cost to project.

2.3 TEMPORARY CONSTRUCTION ACCESS

A. Contractor shall use temporary construction access for the site as exists on site. No new access points will be granted.

PART 3 - EXECUTION

3.1 MAINTENANCE AND REMOVAL

A. Maintain temporary facilities and controls as long as needed for safe and proper completion of the work.

B. Remove such temporary facilities and controls as rapidly as progress of the work will permit, or as directed by the Engineer.

END OF SECTION

SECTION 01640

PRODUCT HANDLING

PART 1 - GENERAL

1.1 DESCRIPTION

A. Work included: Protect products scheduled for use in the work by means including, but not necessarily limited to, those described in this Section.

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.

1.2 QUALITY ASSURANCE

A. Include within the Contractor's quality assurance program such procedures as are required to assure full protection of work and materials.

1.3 MANUFACTURERS' RECOMMENDATIONS

A. Except as otherwise approved by the Engineer, determine and comply with manufacturer's recommendations on product handling, storage and protection.

1.4 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.

1.5 PROTECTION OF MATERIAL AND WORK

A. General:

1. Carefully and properly protect all materials of every description, both before and after being used in the Work in accordance with manufacturer's recommendations.
2. Provide any enclosing or special protection from weather deemed necessary by the Engineer at no additional cost to the Owner.

B. 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.

C. Maintain finished surfaces clean, unmarred, and suitably protected until accepted by the Owner.

1.6 STORAGE

A. Store all items of equipment, component parts, etc., in accordance with the manufacturers' recommendations or as may otherwise be necessary to prevent damage or deterioration of any sort.

B. Electrical and control equipment:

1. Store in a dry area protected from dust and humidity.
2. Equipment can be protected by a weatherproof cover if shipped to the site no more than two (2) weeks prior to installation and energization.

1.7 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.

PART 2 – PRODUCTS (NOT APPLICABLE)

PART 3 – EXECUTION (NOT APPLICABLE)

END OF SECTION

SECTION 01700

CONTRACT CLOSEOUT

PART 1 - GENERAL

1.1 DESCRIPTION

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. 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. Other requirements for technical services are stated in other sections of these Specifications.
3. Section 01720 - Project Record Documents.

1.2 SUBSTANTIAL COMPLETION

A. The Contractor shall notify the Engineer that, in his opinion, the project is substantially complete. A written statement listing items complete shall be submitted.

B. Upon receipt of the Contractor's notice, the Engineer shall make an observation to determine if substantial completion is provided.

C. 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.

1.3 FINAL OBSERVATION

A. 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.

1.4 REOBSERVATION

A. Re-observation required due to failure by the Contractor to make previously noted corrections will be performed by the Engineer.

B. 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.

C. Re-observations will continue until the work is acceptable to the Engineer.

1.5 COMPLETION BY CONTRACTOR

A. When the Engineer finds the Contractor's work acceptable, the Contractor shall be given such notice and should proceed with closeout submittals.

B. Closeout submittals shall contain at least the following:

1. Project record documents.
2. Equipment operation and maintenance manuals and copies of start-up reports.
3. Warranties and bonds.
4. Keys and keying schedule.
5. Spare parts and manuals.
6. Evidence of payment and release to liens per General Conditions.
7. Section 00690 - Contractor's Affidavit.

1.6 FINAL PAYMENT

A. 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:

1. Previous change orders.
2. Unit prices.
3. Deductions for uncorrected work.
4. Deductions for liquidated damages.
5. Deductions for re-testing work.
6. Deductions for re-observation.
7. Deductions for shop drawing review.
8. Adjusted contract sum.
9. Previous payments.
10. Amount due.

B. When required, the Engineer will prepare a contract change order for adjustments not previously made.

PART 2 – PRODUCTS (NOT APPLICABLE)

PART 3 – EXECUTION (NOT APPLICABLE)

END OF SECTION

SECTION 01720

PROJECT RECORD DOCUMENTS

PART 1 - GENERAL

1.1 DESCRIPTION

A. Work included:

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, Supplementary 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.

1.2 QUALITY ASSURANCE

A. Delegate the responsibility for maintenance of Record Documents to one person on the Contractor's staff as approved by the Engineer.

B. 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.

1.3 SUBMITTALS

A. 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.

B. Prior to submitting each request for progress payment, secure the Engineer's approval of the current status of the Project Record Documents.

C. Prior to submitting request for final payment, submit the final Project Record Documents to the Engineer and secure his approval.

1.4 PRODUCT HANDLING

A. 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.

B. In the event of loss of recorded data, use means necessary to again secure the data to the Engineer's approval.

1. Such means shall include, if necessary in the opinion of the Engineer, removal and replacement of concealing materials.
2. In such case, provide replacements to the standards originally required by the Contract Documents.

PART 2 - PRODUCTS

2.1 JOB SET DOCUMENTS

A. 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.

PART 3 - EXECUTION

3.1 MAINTENANCE OF JOB SET

A. 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".

B. Preservation:

1. 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.
2. Do not use the job set for any purpose except entry of new data and for review by the Engineer.
3. Maintain the job set at the site of Work as that site is designated by the Engineer.

C. Field work and making entries on Job Set Drawings:

1. Use erasable colored pencil, preferably red (not ink or indelible pencil) to delineate changes.
2. Show by station number location of all fittings, manholes, valves, wye locations, etc.
3. Reference all fittings and valves at least to two aboveground items reasonably safe from being relocated and indicate such references on the drawings.
4. Reference all pipelines from the center of the parallel roadway at least every 100 feet or where changes occur in the direction of the pipeline.
5. Reference all bores from the center of the roadway to the beginning and end of the casing and ductile iron pipe. Depths of bury must also be provided.
6. Reference all stream crossings and their distance from the center of the parallel roadway and the bridge or other obstruction. A profile of the stream crossing shall also be provided to show the depth of the pipeline under the stream.
7. Field measure and reference all fittings and valves to two aboveground items reasonably safe from being relocated and indicate such references on the drawings.
8. Show location of electrical conduit, pull boxes, etc.
9. Gravity sewers and storm sewers
   a. Provide survey grade state plane Geographic Information System (G.I.S.) electronic data horizontal coordinates for each manhole location.
   b. Provide ground elevation, top elevation and invert elevations for each manhole.
   c. Comply with Section 01050.1

D. Submittal:

1. Submit "marked-up" set of drawings to the Engineer.
2. Make any necessary additions as required by the Engineer.

END OF SECTION

SECTION 02010

SUBSURFACE INVESTIGATION

PART 1 - GENERAL

1.1 DESCRIPTION

A. Soils investigation report:

1. A soils investigation reports has not been prepared for the site.

B. Use of data:

1. It is the responsibility of the Bidders to visit the site and acquaint themselves with existing conditions.
2. Prior to bidding, bidders may make their own subsurface investigations to satisfy themselves as to site and subsurface conditions, but such investigations may be performed only under time schedules and arrangements approved in advance by the Engineer.

1.2 QUALITY ASSURANCE

A. A soil engineer will be retained by the Owner to observe performance of work in connection with excavating, trenching, filling, backfilling and grading, and to perform compaction tests.

B. Readjust work performed that does not meet technical or design requirements, but make no deviation from the Contract Documents without specific and written approval from the Engineer.

END OF SECTION

SECTION 02060

DEMOLITION

PART 1 - GENERAL

1.1 DESCRIPTION

A. Work included: Demolish and remove from the site those items so indicated on the Drawings, including buildings, building pads, parking and roadway areas, miscellaneous structures, poles, walls, utilities, signs, etc.

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 02110 – Clearing and Grubbing
3. Section 02616 - Milling, Cutting, and Replacing Pavements

1.2 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 the Standard Building Code with due regard to the protection of the public and the provision of safeguards during the performance of the work.

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

D. Comply with requirements of governmental agencies having jurisdiction.

E. Contractor is responsible for being aware of and complying with Asbestos NESHAP regulations, as well as other applicable codes, laws and regulations.

1. The Owner is to be notified immediately upon discovery of asbestos materials.

PART 2 - PRODUCTS

A. No products are required in this Section.

PART 3 - EXECUTION

3.1 SURFACE CONDITIONS

A. Examine the areas and conditions under which work of this Section will be performed. Correct conditions detrimental to the safe, timely, and proper completion of the Work. Do not proceed until unsatisfactory conditions are corrected.

3.2 DEMOLITION

A. General:

1. Prior to start of demolition, carefully study the Drawings and these Specifications.
2. In company with the Owner's representative, visit the site and verify the extent of demolition to be performed under this Contract.

B. Using only the means and equipment approved for this purpose by the governmental agencies having jurisdiction, demolish and completely remove from the job site the existing construction designated to be removed.

1. Shut off, cap, reroute, and otherwise protect existing public utility lines in accordance with the requirements of the public agency or utility having jurisdiction.
2. Remove rocks larger than 12" diameter, roots, wood, and debris.

C. Demolished material shall be considered to be property of the Contractor and shall be completely removed from the job site.

D. Use means necessary to prevent dust from becoming a nuisance to the public, to neighbors, and to other work being performed on or near the site.

E. Use any means necessary to protect the public safety during the demolition process.

F. Use whatever means necessary to protect the adjacent structures from damage during demolition.

G. Protection of trees: It may become desirable to save certain trees in areas where cut or fill is eighteen inches or less and in parking areas. Consequently, the Contractor shall obtain approval from Engineer prior to removal of significant trees from such areas. The Contractor shall protect existing trees to remain during construction by constructing barricades around such trees as directed.

H. Erosion control: Construct and maintain erosion control as shown on the Drawings and in accordance with the City of Columbia requirements.

3.3 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 project.

END OF SECTION

SECTION 02110

CLEARING AND GRUBBING

PART 1 - GENERAL

1.1 DESCRIPTION

A. Work included: Remove trees, underbrush, undesirable growth, stumps, roots, etc., from the area to the limits shown on the Drawings, as specified herein, and as needed to meet the requirements of the construction shown in the Contract Documents.

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.

1.2 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.

C. Comply with requirements of governmental agencies having jurisdiction.

PART 2 - PRODUCTS

No products are required for this work.

PART 3 - EXECUTION

3.1 AREA INCLUDED

A. All streets, parking areas, and any other areas as indicated on the Drawings.

3.2 PROCEDURES

A. Clearing and grubbing: The entire area within the limit lines described above shall be cleared and grubbed. Remove all vegetation, trees, brush, stumps, etc., from the area. All debris from this operation shall be burned if allowed by local regulations or shall otherwise be disposed of off the Owner's property.

B. Selective clearing shall be done in areas designated by the Engineer. Selective clearing shall consist of removing vegetation, brush, stumps, etc., from the area. Selected trees shall be left standing and care shall be taken not to damage trees to be left. All debris from this operation shall be burned if allowed by local regulations or shall otherwise be disposed of off the Owner's property. Grubbing will not be required in areas designated for selective clearing.

C. Removal of trees and shrubs: All trees to be removed shall be felled in such a manner as to avoid injury to remaining trees and to other features not proposed for removal. Trees shall be cut up and the trunks, limbs, and other debris shall be removed from the site. Undesirable shrubs and small trees shall be selectively removed as directed.

D. Burning: Where applicable, grinding of debris is recommended over burning. Burning may be allowed upon Contractor's approval of local, state, and federal regulations, including the Forestry Department and the South Carolina Department of Health and Environmental Control and the following:

1. The location of the burning must be a sufficient distance but not less than 1000 feet from public roadways and all residential, commercial, and industrial sites not a part of the contiguous property on which the burning is conducted.
2. Winds during the time of the burning must be away from any area in which the ambient air may be significantly affected by smoke from the burning if that area contains a public roadway or residential, commercial, or industrial site.
3. Minimize the amount of dirt on the material being burned.
4. Do not burn any heavy oils, asphaltic materials, items containing natural or synthetic rubber, or any materials other than plant growth.
5. Start the initial burning only between the hours of 9:00 a.m. and 3:00 p.m.; do not add any combustible material to the fire between 3:00 p.m. of one day and 9:00 a.m. the following day.
6. No more than two piles 30' x 30' or equivalent may be burned within a six (6) acre area at one time.
7. Do not burn any salvageable timber and pulpwood.

E. 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 may be cut off not less than 18" below any subgrade. The area of operation then shall be cleared of resulting debris and matted roots, weeds and other extraneous matter and such shall be hauled away from the site. Generally, all material that cannot be compacted to 90% maximum density in lawn areas and 95% of maximum density elsewhere shall be removed.

F. Protection of trees: It may become desirable to save certain trees in areas where cut or fill is eighteen inches or less and in parking areas. Consequently, the Contractor shall obtain approval from Engineer prior to removal of significant trees from such areas. The Contractor shall protect existing trees to remain during construction by constructing barricades around such trees as directed.

G. Erosion control: Construct and maintain erosion control as shown on the Drawings and in accordance with Section 02260: Erosion and Sediment Control, and the local County's requirements.

3.3 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 project.

END OF SECTION

SECTION 02210

SITE GRADING

PART 1 - GENERAL

1.1 DESCRIPTION

A. Work included: Cut, fill, excavate, backfill, compact and grade the site as necessary to bring the roads, drives, 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. Roadway, parking area, drive and walk subgrade preparation.
   b. Excavations and formations of embankments.
   c. Dressing of graded areas, shoulders and ditches.

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 02110 - Clearing and Grubbing.
3. Section 02220 - Excavating, Backfilling for Structures.
4. Section 02221 - Trenching, Backfilling for Utilities.
5. Section 02260 - Erosion and Sediment Control.
6. Section 02510 - Stone Base Course.
7. Section 02721 - Sewers: Storm Drainage.

C. Definitions:

1. Open areas: Open areas shall be those areas that do not include building sites, paved areas, street right-of-way and parking areas.
2. Maximum density: Maximum weight in pounds per cubic foot of a specific material.
3. Optimum moisture: Percentage of water in a specific material at maximum density.
4. 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.
5. 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.
6. 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.

7. 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.
8. 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.
9. Crushed stone (gravel): Crushed stone shall be No. 57 aggregate or equal conforming to ASTM C-33.
10. Excavation: Excavation is defined as unclassified excavation of every description regardless of materials encountered.

D. The Contractor must determine for himself the volume of material required by the site.

1.2 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. 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.

1.3 PRODUCT HANDLING

A. Comply with pertinent provisions of Section 01640.

1.4 JOB CONDITIONS

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.
2. Notification of intent to excavate may be given by calling this toll free number: 1-800-922-0983.
3. Notify Owner so that their privately owned utilities may also be located prior to construction.

PART 2 - PRODUCTS

2.1 SOIL MATERIALS

A. 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.

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 embankment.

B. 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.

C. 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.

2.2 TOPSOIL

A. Use screened topsoil consisting of material removed from the top 3" to 6" of existing on-site soils.

B. Use topsoil containing no stones, roots or large clods of soil.

C. Stockpile topsoil separate from other excavated material.

D. If insufficient volume of topsoil is not available from existing on-site soils, then screened topsoil shall be imported at no additional expense to the Owner.

2.3 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.

2.4 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

3.1 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.

3.2 PREPARATION

A. Clearing and grubbing: Clear and grub areas to be graded prior to commencement of the grading operations, if necessary.

B. Where so directed by the Owner, protect and leave standing designated desirable trees.

C. Complete any demolition and/or removal work as may be required prior to grading operations.

D. Dispose of all clearing, grubbing and demolition debris and other deleterious material off the project site.

E. 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.

F. 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.

3.3 FINISH ELEVATIONS AND LINES

A. Construct areas outside of building or structure lines true to grades shown.

1. Where no grade is indicated, shape finish surface to drain away from buildings or structures, as approved by the Engineer.

B. Degree of finish shall be that ordinarily obtainable from bladegrader, supplemented with hand raking and finishing.

C. Finish surfaces to within 0.10' above or below the established grade or approved cross section.

3.4 GENERAL PROCEDURES

A. 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.

B. 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.

C. 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.

D. Maintain access to adjacent areas at all times.

E. Excavate and backfill in a manner and sequence that will provide proper drainage at all times.

3.5 EXCAVATING (CUTS)

A. Perform excavating of every type of material encountered within the limits of the Work to the lines, grades and elevations indicated and specified herein.

B. 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.

C. Unsuitable excavated material: Remove from the site and dispose of all unsuitable material unless otherwise approved by the Engineer.

D. 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.

E. 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.

F. Authorized overexcavation:

1. 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 the unit prices determined by the Engineer.

3.6 FILLING AND BACKFILLING

A. 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.

B. 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.

C. Do not use broken concrete or asphaltic pavement in fills, unless it is crushed and graded to acceptable standards.

D. Selection of borrow material:

1. 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.

E. 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.

F. 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.

G. 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:

Top 12" of subgrade	100%
All other fill material	98%
(See Section 02220 for additional compaction requirements for fill beneath structures)	

3. Fill beneath roadway:

Top 12" of subgrade	100%
All other fill material	95%

4. Embankments:

Top 12" of subgrade	98%
All other fill material	95%

5. Fill beneath walkways:

Top 12" of subgrade	95%
All other fill material	90%

6. Lawn and unpaved open areas:

All other fill material	90%

3.7 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. Grading adjacent to structures: Grade areas adjacent to buildings to achieve drainage away from the structures and to prevent ponding.

C. 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.

3.8 FIELD QUALITY CONTROL

A. Secure the Engineer's construction review and observation and approval of subgrades and fill layers before subsequent construction is permitted thereon.

B. Field density tests will be performed as determined by the Owner, 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.
4. Other tests as deemed necessary by the Engineer or Owner.

C. 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.

D. 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.

3.9 PLACING TOPSOIL

A. Upon completion of site grading and other related site work, screened 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.

B. Place, level and lightly compact topsoil to a depth of not less than 4".

C. Maintain topsoil free of roots, rocks, debris, clods of soil and any other objectionable material which might hinder subsequent grassing or mowing operations.

D. Any surplus materials shall be disposed of in approved areas on the site.

3.10 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.

3.12 MEASUREMENT AND PAYMENT

A. The work under this Section and all costs for same shall be included in the price bid for the item to which it pertains with additional or deductive payments allowed for the specified items based on the unit prices given in the Bid Form.

B. Additive or deductive items:

1. Rock excavation above or below that indicated on the drawings.
2. Removal of additional unsuitable material.
3. Backfill and compaction of suitable material to replace unsuitable material.

END OF SECTION

SECTION 02221

TRENCHING, BACKFILLING FOR UTILITIES

PART 1 - GENERAL

1.1 DESCRIPTION

A. Work included: Trench, backfill, and compact as specified herein and as needed for installation of underground utilities associated with the Work.

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 02721 - Sewers: Storm Drainage.

1.2 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.

1.3 JOB CONDITIONS

A. Existing utilities:

1. There now exists in the construction areas, waterworks, storm drainage, sanitary sewers, street paving, gas mains, power, telecommunications 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.

2. Notification of intent to excavate may be given by calling this toll free number: 1-888-721-7877.
3. Notify Owner so that their privately owned utilities may also be located prior to construction.

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.
   a. For existing areas with sod type grasses, replace with new sod. Existing sod may be reused where properly removed and stored.
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.

2. Sack breakers are to be used on steep slopes along creek banks and fill slopes to prevent washing of ditch. Sack breakers are to be placed at the direction of the Engineer.

H. Blasting (Only if previously approved in writing by Owner and all Federal, State and/or Local Agencies):

1. Store all explosives in a secure manner, complying with all laws, ordinances, and regulations.
2. Contractor shall be responsible for damage caused by blasting operations.

PART 2 - PRODUCTS

2.1 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.

2.2 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.

2.3 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 at no additional expense to the Owner.

PART 3 - EXECUTION

3.1 PROCEDURES

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.

B. Locations within streets or highways:

1. 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*".
2. Take all precautions and comply with all requirements as may be necessary to protect the improvements, including barricades for protection of traffic.
3. Keep minimum of one lane open to traffic at all times where utility crosses street or highway.

C. Protection of persons and property:

1. Barricade open holes and depressions occurring as part of the 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.

D. Dewatering:

1. Remove all surface and subsurface waters from excavations and maintain the excavation in a dry condition during construction operations.
2. Maintain the ground water level a minimum of 3-feet below the trench bottom during excavation, installation and backfilling.
   a. Material disturbed below the invert elevation due to improper dewatering shall be removed and replaced with crushed stone or lean concrete at no expense to the Owner.
   b. Use sumps, pumps, drains, trenching, wells, vacuum or well point system as necessary to maintain the ground water level a minimum of 3-feet below the trench bottom and maintain a dry excavation.
   c. 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.
   d. Provide monitoring wells sufficient in size, location, number and depth to monitor the ground water level in the construction area during excavation and backfill operations.
   e. Maintain dewatering operations until backfilling and compaction operations are complete.
3. Dispose of water pumped from excavations in storm drains having capacity, canals, trenches or other approved locations.
   a. Contractor is responsible for acquiring all permits required to discharge the water and shall protect waterways from turbidity during the operation.
   b. Prevent flooding of streets, roadways, or private property.
   c. Provide engines driving dewatering pumps with residential type mufflers.

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.

3.2 TRENCH EXCAVATION (Unclassified)

A. Remove all materials of whatever substance encountered.

B. Where trenching occurs in existing lawns, remove turf in sections and keep damp. Replace turf upon completion of the backfilling.

C. 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.

D. 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.

E. 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.

F. 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.

G. Special requirements relating to excavation for specific types of utilities shall comply with the following:

1. Water distribution lines:
   a. Provide depth of cover shown or minimum cover of 36", whichever is greater.

b. Where minimum cover only is required, carry excavations to depths necessary to properly grade the pipe on tangents and vertical curves as directed by the Engineer.
c. Provide minimum clearance of 6" between pipe walls and trench walls or sheeting and bracing lines.
d. If minimum cover of 36" cannot be provided, then thermoplastic piping may not be used. Use ductile iron piping or other Engineer-approved material.

2. 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.

3. Sewers, Sanitary Pressure: (Force Main):
a. Comply with requirements of Section 02723.
b. Grade trenches to avoid high points, unless otherwise indicated.
c. Provide minimum cover of 36".
d. Provide minimum clearance of 6" between pipe walls and trench wall or sheeting and bracing lines.
e. If minimum cover of 36" cannot be provided, then thermoplastic piping may not be used. Use ductile iron piping or other Engineer-approved material.

4. Electrical conduit:
a. Provide depth of cover shown or minimum cover of 36", whichever is greater.
b. Where minimum cover only is required, carry excavations to depths necessary to properly grade the conduit on tangents and vertical curves as directed by the Engineer.
c. Provide minimum clearance of 12" between conduit and trench wall or sheeting and bracing lines.
d. If minimum cover of 36" cannot be provided, then thermoplastic piping may not be used. Use ductile iron piping or other Engineer-approved material.

5. Gas distribution lines:
a. Provide depth of cover shown or minimum cover of 48", whichever is greater.
b. Where lines are constructed in the rights-of-way of the South Carolina Department of Transportation, provide minimum cover of 48" below the elevation of the pavement.
c. Where minimum cover only is required, carry excavations to depths necessary to properly grade the pipe on tangents and vertical curves as directed by the Engineer.
d. Grade trenches to avoid high points.
e. Provide minimum clearance of 6" between pipe walls and trench walls or sheeting and bracing lines.

H. Comply with pertinent OSHA regulations in regards to the excavation of utilities.

3.3 BACKFILLING

A. General:

1. Backfill trenches and excavations immediately after the pipes are laid, unless other protection is directed or indicated.

2. Select and deposit backfill materials with special reference to the future safety of the pipes.
3. 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.
4. Surplus material shall be disposed of as directed by the Engineer.
5. Original surface shall be restored to the approval of the Engineer.
6. Maintain proper dewatering during backfill and compaction operations.

B. 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.

C. 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.

D. Adjacent to buildings: Mechanically compact backfill in 6" layers within ten (10') feet of buildings.

E. 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.

F. 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.

3.4 MEASUREMENT AND PAYMENT

A. Unclassified excavation for trenching:

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.

END OF SECTION

SECTION 02231

TREE PROTECTION AND MAINTENANCE

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

A. Tree removal, protection, and maintenance of trees where shown on drawings.

B. Landscape Architect to flag all trees to be removed before proceeding with clearing.

1.2 TREE PROTECTION BARRIER

A. A tree protection barrier, as shown in the plans, shall be constructed around the existing trees to remain. Each barrier shall be constructed immediately after the demolition and hand removal of pavement within ten feet of the tree and BEFORE any additional demolition- or construction-related activities occur.

B. The established protected perimeter around the tree shall be based on one foot in radius per one inch of tree diameter as measured 4.5 feet above grade (e.g. a seven-inch diameter tree will have a protected area with a seven-foot radius and 14-foot diameter around the tree) unless shown otherwise on the plans.

C. No materials, equipment, trailers, spoil, waste or washout water may be deposited, stored or parked within tree protection areas. All underground utilities, drains, and irrigation lines shall be routed outside the tree protection zone. If lines must traverse the tree protection zone, they shall be tunneled or bored under the tree.

D. Any herbicides placed under paving materials or in planting beds must be safe for use around trees and labeled for that use. Any pesticides used on site must be tree-safe and not easily transported by water.

1.3 OBSERVATION

A. Any demolition, grading, or construction work that is expected to encounter tree roots shall be monitored by the Landscape Architect or consulting arborist.

PART 2 - TREE MAINTENANCE

2.1 PRUNING

A. Pre-construction tree pruning shall be performed to clean the crown of dead, diseased, crossing and/or weak wood, and to provide adequate clearance for equipment and construction. All pruning shall be performed by a qualified arborist certified by the International Society of Arboriculture, and shall be in accordance with the International Society of Arboriculture's Tree Pruning Guidelines 91995) and/or the ANSI A300 Pruning Standard (1995). In most cases no more than 20 percent of the live foliage should be removed from the tree. Brush can be chipped and spread under the tree for mulch to help protect against soil compaction, to ameliorate soil temperatures, and to conserve soil moisture.

B. All trees within the project area shall be pruned to:

1. clear the crown of diseased, crossing, weak and dead wood to a minimum of 1.5 inches in diameter;
2. remove stubs, cutting outside the wound-wood tissue that has formed around the branch;
3. reduce end weight on heavy, horizontal branches by selectively removing small diameter branches no greater that 2-3inches, near the ends of the scaffolds.

C. Where temporary clearance is needed for access, branches shall be tied back to hold them out of the clearance zone.

D. Interior branches shall not be stripped out (i.e. no "lion-tailing").

E. Pruning cuts larger than 4 inches in diameter, except for dead wood, shall be avoided unless absolutely necessary.

F. Pruning cuts that expose heartwood shall be avoided whenever possible.

G. No more than 20% of live foliage shall be removed within the tree.

H. While in the tree, the arborist shall perform an aerial inspection to identify defects that require treatment. Any additional work needed shall be reported to the Owner.

2.2 FERTILIZATION

A. No fertilizer should be applied to trees in the project area prior to construction.

PART 3 - EXECUTION

3.1 TREE REMOVAL AND DEMOLITION ACTIVITIES

A. The demolition contractor shall meet with the Landscape Architect at the site prior to beginning work to review all work procedures, access, haul routes, and tree protection measures.

B. The limits of all tree protection measures shall be staked in the field.

C. Trees to be removed that have branches extending into the canopy of trees to remain must be removed by a qualified arborist and not by demolition or construction contractors. The qualified arborist shall remove the tree in a manner that causes no damage to the trees and under-story to remain.

D. Any brush clearing required with the tree protection zones shall be accomplished with hand-operated equipment.

E. Trees to be removed shall be felled so as to fall away from tree protection zones and to avoid pulling and breaking of roots of trees to remain. If roots are entwined, the landscape architect may require first severing the major woody root mass before extracting the trees. This may be accomplished by cutting through the roots by hand, with a vibrating knife, rock saw, narrow trencher with sharp blades, or other approved root-pruning equipment.

F. Trees to be removed from within a tree protection zone shall be removed by a qualified arborist. The trees shall be cut near ground level and the stump ground out.

G. All downed brush and trees shall be removed from the tree protection zone either by hand or with equipment sitting outside the tree protection zone. Extraction shall occur by lifting the material out, not by skidding it across the ground.

H. Brush shall be chipped and placed in the tree protection zone to a depth of 6 inches.

I. Structures and underground features to be removed with tree protection zones shall use the smallest equipment possible and operate from outside the tree protection zone. The Landscape Architect shall be on site during all operations within the tree protections zone to monitor activity.

J. All trees shall be pruned in accordance with the guidelines in this Section.

K. Any damage to trees due to demolition activities shall be reported to the Owner within 6 hours so that remedial action may be taken. Timeliness is critical to tree health.

L. If temporary haul or access roads must pass over the root area of trees to be retained, a road bed of 6" of mulch shall be created to protect the soil from compaction. The road bed shall be replenished as necessary to maintain a 6" depth.

3.2 METHODS OF EXCAVATION NEAR ROOTS

A. Air Spade. Soil excavation near tree roots and/or to determine location of tree roots in the areas outlined below shall be conducted with a model 2000 Air Spade equipped with a 225 scfm (6.2m^3/min.) nozzle. Further specifications for this spade and ordering information are available upon request.

B. Compressor. The Air Spade and nozzle combination listed above requires a 250 scfm or greater air compressor. Air compressors with less pressure will overheat during use and cause poor tool performance.

C. Sewer Vacuum. A sewer vacuum can be used to remove the soil dislodged by the Air Spade if it cannot be easily blown clear of the hole or trench.

D. Interval Exploratory or Test Trenches shall be dug with the Air Spade to determine the location of roots before any digging within the established protected perimeter area around the tree based on a radius equal to one foot per one inch of tree diameter as measured 4.5 feet above grade.

E. Test trenches shall be eight inches deep and four to six inches wide.

3.3 ROOT CONFLICTS

A. Within excavation areas, roots should first be pruned to sever them cleanly. Only those roots that will be affected should be pruned. Root pruning is most efficiently accomplished with equipment specifically designed for that purpose. Large circular saws used to cut concrete, and rock saws are also effective. The saws must cut through the woody roots to the depth of the required excavation. Root pruning equipment designed primarily for curb and sidewalk repair may only cut 8-12 inches deep.

B. Stake the edge of the excavation.

C. Cut with root pruning equipment 6-12 inches outside the staked line toward the tree. If root pruning equipment cannot be used, dig a trench along the staked line. Equipment such as backhoe can be used until roots larger than 1 inch in diameter are encountered. The roots shall be exposed by hand excavation or Air Spade.

D. When a root is encountered expose it by removing soil by hand and cut it cleanly with a saw at the outside edge of the trench (toward the tree). Cut to a lateral root when possible. Roots smaller than two inches in diameter that must be severed shall be cut with a hand pruning saw.

E. Paints and wound treatments shall not be used on any cut surfaces.

F. Replace soil in the trench. Use of sandy/loam soils is encouraged.

G. When roots have been excavated, but not cut, they shall not remain uncovered for more than two days.

H. Roots that have necessarily been pruned shall be recovered with soil within one hour.

3.4 AVOIDING TREE TRUNK AND BRANCH DAMAGE

A. Mechanical. Care shall be taken not to contact the canopy when operating large equipment or vehicles in the proximity of any protected trees.

B. Heat. Equipment and trucks shall not be operated or left idling under the canopy of any protected trees, so that no damage occurs from radiant heat or exhaust. Paving equipment is particularly damaging and shall not be operated under the tree canopies any longer than is required to pave the area.

PART 4 - INSTALLATION OF UTILITIES NEAR TREES

4.1 GENERAL

A. For the installation of utility lines the contractor shall consult with the Landscape Architect prior to trenching to establish an acceptable method for excavation. The method of excavation shall be approved by the Landscape Architect and shall be one of the methods described in this section. Boring under tree roots shall be an acceptable method for the installation of utilities in order to avoid cutting roots. Bores shall be at a minimum depth of 30".

B. Buried Wiring and Plumbing Near Trees. Wiring for the street lights or traffic lights, communication conduits, or plumbing for irrigation which is in conflict with roots two inches or greater in diameter, or is closer than the established protected perimeter area around a tree (see Section 1.1 above) shall be installed in a trench dug by an air spade and the conduit and/or plumbing fitted around the tree roots.

C. Sewer Service Lines. Where sewer lines are identified to run in areas with roots two inches or greater in diameter, or are closer than the established protected perimeter area around a tree, the Landscape Architect shall be consulted before digging begins to discuss possible alternatives to avoid damaging tree roots.

D. Water Service Lines. When possible, water service lines shall be placed in the same trenches that are used for sewer services. If a separate trench is needed and the trench is located in an area with roots two inches or greater in diameter or is closer than the established protected perimeter area around a tree (see Section 1.1 above), digging shall be done with an Air Spade and the pipes installed beneath the tree roots.

PART 4 – TREE PLANTING & STABILIZATION

4.1 METHODS

A. Reducing root ball depth. In the event that the depth of a root ball must be reduced to accommodate planting over duct banks or other infrastructure, the Landscape Architect shall be present to supervise.

B. Stake trees as necessary with traditional guying methods, but ensure that wires are not used around tree trunks. Provide rubber hosing at wire or use polypropylene webbing. See plans for details.

END OF SECTION

SECTION 02260

EROSION AND SEDIMENT CONTROL

PART 1 - GENERAL

1.1 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.

1.2 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

2.1 CRUSHED STONE

A. Provide #57 crushed stone for temporary sediment barriers around inlets and for temporary stone check dams.

2.2 GRASSING

A. Comply with Section 02930 - Grassing.

2.3 SILT FENCE

A. All posts to be self-fastener angle steel, 5' in length.

1. Wooden posts are not acceptable.

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.

1. Securely attach woven wire to posts with wire ties.

C. Filter fabric shall be Mirafi 600X synthetic fabric as manufactured by Celanese Fibers Co., Bidim C34 as manufactured by DuPont or approved equal.

1. Limit splices in filter fabric using continuous rolls whenever possible.
2. Whenever splices are necessary a minimum overlap of 6" is required and all splices must occur at a post so that the integrity of the fence is not compromised.
3. Securely attach filter fabric to top of woven wire and at posts with wire ties.

D. Silt fences should be continuous and transverse to the flow. The silt fence should follow the contours of the site as closely as possible. Place the fence such that the water cannot runoff around the end of the fence.

2.4 EROSION CONTROL BLANKET

A. Use erosion control blanket S150, from North American Green or approved equal.

1. Use Biostakes where staples are required or indicated on the drawings for stabilization.
   a. Staple in pattern recommended by blanket manufacturer.
2. Staple locations must be clearly marked on the blanket when stakes are used.

PART 3 - EXECUTION

3.1 GENERAL

A. Construct and maintain all erosion control measures until the substantial completion of the project.

3.2 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.

3.3 TEMPORARY GRASSING

A. Provide a temporary cover for erosion control on disturbed areas that will remain unstabilized for a period of more than 30 days in accordance with Section 02930.

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 1 year.

C. Provide grassing on slope 5% or greater within 14 days of disturbance. Comply with Section 02930.

3.4 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. Space posts 10'-0" on center, maximum or as indicated on the drawings.

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.

3.5 INLET PROTECTION

A. Construct temporary sediment barriers around storm drain curb inlets using block and gravel as indicated on the drawings.

B. Construct metal frame barriers around grate and frame of drop inlets as indicated on the drawings.

C. Sediment tubes may be used as an inlet protection method. This shall comply with current SCDHEC requirements.

D. Inspect structure after each rainfall and repair as required.

E. Remove sediment when trap reaches one-half capacity.

F. Repair any torn fabric or bent posts.

G. Remove structure when protected areas have been stabilized.

3.6 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.

3.9 MAINTENANCE

A. Place all erosion control devices or measures prior to any land disturbing activity within the drainage area they are located.

B. Inspect erosion control devices and clean or otherwise remove silt buildup as necessary once a week or 24-hours following a rain event of $\geq$ 0.1".

3.10 REMOVAL

A. Remove temporary structures after protected areas have been stabilized.

3.11 MEASUREMENT AND PAYMENT

A. No separate measurement or direct payment will be made for the items under this Section and all costs for same shall be included in the price bid for the project.

END OF SECTION

SECTION 02510

STONE BASE COURSE

PART 1 - GENERAL

1.1 DESCRIPTION

A. Work included: Provide crushed stone base (with prime) constructed on the compacted subgrade where shown on the Drawings, as specified herein, and as needed for a complete and proper installation.

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 02210 - Site Grading.
3. Section 02513 - Asphaltic Concrete Paving.

1.2 QUALITY ASSURANCE

A. Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this Section.

1.3 SUBMITTALS

A. Comply with pertinent provisions of Section 01340.

B. Certificates, signed by materials producer, stating that materials meet the specified requirements.

1.4 PRODUCT HANDLING

A. Comply with pertinent provisions of Section 01640.

PART 2 - PRODUCTS

2.1 COARSE AGGREGATE

A. Furnish a coarse aggregate (retained on No. 4 sieve) consisting of hard, durable particles of stone, reasonably free from soft, thin, elongated or laminated pieces and deleterious substances.

B. Furnish aggregate with an abrasion loss of less than 65% as measured by the Los Angeles Abrasion Test.

2.2 FINE AGGREGATE

A. Furnish a fine aggregate consisting of material produced by stone crushing operations.

B. Liquid limit shall not exceed 25 and the plasticity index shall not exceed 6 when tested in accordance with AASHTO T-89 and T-90, respectively.

2.3 COMPOSITE MIXTURE

A. Produce in one crushing operation or by blending the fine and coarse aggregate in proper proportions.

B. After the materials have been mixed, laid down, and initial compaction operations begun, the composite mixture shall conform to the following:

Sieve Designation	Percent by Weight Passing
2"	100
1-1/2"	95-100
1"	70-100
1/2"	48-75
No. 4	30-50
No. 30	11-30
No. 200	0-12
Liquid Limit	25 max.
Plasticity Index	6 max.

2.4 PRIME ASPHALT

A. Use either MC-30, RC-30, RC-70, or EA-P complying with requirements of Sections 406, 407 and 408 of the South Carolina Department of Transportation specifications.

PART 3 - EXECUTION

3.1 PREPARATION OF SUBGRADE

A. Proofroll all areas to receive crushed stone paving.

1. Make not less than three passes over the full area, using a 35 to 50 ton rubber tired roller.

B. Remove all soft, unstable or unsuitable material that will not compact readily.

1. Remove to full depth of unsuitable material, or to a depth of 30", whichever is less.
2. Replace with satisfactory materials.

C. Fill all holes, ruts or depressions which develop in the subgrade with approved on-site material, bringing subgrade to indicated line and grades.

D. Compact subgrade using suitable construction procedures to provide not less than 95% Standard Proctor Maximum Dry Density.

E. Seal roll the subgrade surface with a steel wheel roller, sealing the surface against excessive water infiltration.

3.2 PLACING AND MIXING OF PAVING MATERIAL

A. Place aggregates using spreader boxes or other approved spreaders uniformly on one operation.

B. Take care to avoid segregation of the fine from the coarse aggregate during handling, spreading or shaping operations.

C. Mix, while at proper moisture, with motor grader or other equipment and maintain to required section and grade until thoroughly compacted.

3.3 ROLLING AND COMPACTING

A. Perform using 3-wheel steel wheel roller weighing not less than 10 tons, tandem roller weighing at least 8 tons, or other rollers approved by the Engineer.

B. Start rolling at edges and proceed toward the center, continue rolling until aggregates are firmly keyed or set.

C. When initial compaction is completed, should voids remain, place fine aggregates on the surface in an amount only sufficient to fill the voids.

D. Broom, wet and roll until coarse aggregate is set, bonded and thoroughly compacted for full width and depth.

3.4 ALLOWABLE TOLERANCES

A. Thickness tolerance: Provide the compacted thicknesses shown on the Drawings within a tolerance of minus 1/2".

1. Depth measurements will be made by digging through the base at intervals no closer than 250', nor greater than 500' apart.
2. Where thickness is less than depth specified minus 1/2", it shall be corrected as directed by the Engineer.

B. Smoothness tolerance: Provide the lines and grades shown on the Drawings within a tolerance of 3/8" in 10', parallel to the center line of the roadway nor more than 1/2" from a template conforming to the cross sections shown on the plans.

C. Deviations: Correct by removing materials, replacing with new materials, and reworking or recompacting as required.

3.5 PLACING PRIME COAT

A. Allow base course to season sufficiently to permit uniform penetration.

B. Do not apply to wet surfaces or when the temperature is below 60°F in the shade and falling, or below 55°F in the shade and rising.

C. Clean surfaces of all dust, dirt, clay, etc. using mechanical brooms, etc.

D. Apply prime material, using pneumatic mounted distributors, at a rate of 0.25 to 0.30 gallon per square yard.

E. Permit no traffic on primed surfaces until bituminous material has penetrated and dried sufficiently that it does not pick up under traffic.

3.6 MEASUREMENT AND PAYMENT

A. No separate measurement or direct payment will be made for this work and all costs for same shall be included in the price bid for the work to which it pertains.

END OF SECTION

SECTION 02513

ASPHALTIC CONCRETE PAVING

PART 1 - GENERAL

1.1 DESCRIPTION

A. Work included: Provide asphaltic concrete paving where shown on the Drawings, as specified herein, and as needed for a complete and proper installation.

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 02210 - Site Grading.
3. Section 02577 - Pavement Markings and Signage.
4. Section 02510 - Stone Base Course.
5. Section 02616 - Milling, Cutting and Replacing Asphalt Pavements.

1.2 QUALITY ASSURANCE

A. Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this Section.

1.3 SUBMITTALS

A. Comply with pertinent provisions of Section 01340.

B. Product data: Within fifteen (15) calendar days after the Contractor has received the Owner's Notice to Proceed, submit:

1. Materials list of items proposed to be provided under this Section.
2. Certificates, signed by the materials producer and the asphalt paving Subcontractor, stating that materials meet or exceed the specified requirements.

1.4 PRODUCT HANDLING

A. Comply with pertinent provisions of Section 01640.

PART 2 - PRODUCTS

2.1 GENERAL

A. All materials and products used shall comply with pertinent sections of the South Carolina Department of Transportation's (SCDOT) "Standard Specifications for Highway Construction" and latest revisions and supplements.

2.2 ASPHALTIC CONCRETE MIXTURE (BINDER COURSE)

A. Materials and composition of mixture shall comply with Section 402 of the SCDOT's "Standard Specifications for Highway Construction" and latest revisions and supplements.

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.

2.3 ASPHALTIC CONCRETE MIXTURE (SURFACE COURSE)

A. Materials and composition of mixture shall comply with Section 403 of the SCDOT's "Standard Specifications for Highway Construction" and latest revisions and supplements.

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.

2.4 EQUIPMENT

A. Comply with requirements of Section 401 of SCDOT's "Standard Specifications" and latest revisions and supplements.

PART 3 - EXECUTION

3.1 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.

3.2 WEATHER RESTRICTIONS

A. Do not apply asphalt mixtures to a wet or frozen surface or when air temperature is below 40°F in the shade and falling, or below 35°F in the shade and rising.

3.3 SPREADING AND FINISHING

A. On arrival at point of use, dump directly into mechanical spreader.

B. 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.

C. Correct irregularities while the mixture is still hot.

D. At locations not readily accessible to mechanical spreaders, acceptable hand spreading methods may be used.

E. Finished surfaces placed adjacent to curbs, gutters, manholes, etc., shall be approximately 1/4" above the edges of these structures.

3.4 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.

G. Finished paving smoothness tolerance:

1. Free from birdbaths.
2. No deviations greater than 1/8" in 6'.

3.5 PROTECTION OF SURFACE

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

3.6 FLOOD TEST

A. Flood the entire asphaltic concrete paved area with water by use of a tank truck or hoses.

B. 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.

C. Feather and smooth the edges of fill so that the joint between fill and original surface is invisible.

3.7 MEASUREMENT AND PAYMENT

A. No separate measurement or direct payment will be made for this work and all costs for same shall be included in the price bid for the project.

END OF SECTION

SECTION 02525

CONCRETE CURB AND GUTTER, AND SIDEWALK

PART 1 - GENERAL

1.1 DESCRIPTION

A. Work included: Provide cast-in-place concrete, including formwork, where shown on the Drawings, as specified herein, and as needed for a complete and proper installation.

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.

1.2 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. Reference standards: Comply with the following codes, specifications and standards, except as otherwise shown or specified:

1. American Concrete Institute (ACI) Publications:
   -- ACI 305 Recommended Practice for Hot Weather Concreting
   -- ACI 306 Recommended Practice for Cold Weather Concreting
2. American Society for Testing and Materials (ASTM) Publications:
   -- A 185 Welded Steel Wire Fabric for Concrete Reinforcement
   -- C 31 Making and Curing Concrete Test Specimens in the Field
   -- C 33 Concrete Aggregates
   -- C 39-72 Compressive Strength of Cylindrical Concrete Specimens
   -- C 94 Ready-Mixed Concrete
   -- C 150 Portland Cement
   -- C 260 Air-Entraining Admixtures for Concrete

C. Testing agency: A testing laboratory will be retained by the Owner to perform material evaluation tests required by these specifications.

D. Qualifications of contractors performing concrete work: Minimum of two (2) years experience on comparable concrete projects.

E. Plant qualification: Plant equipment and facilities shall meet all requirements of the Check List for Certification of Ready Mixed Concrete Production Facilities of the National Ready Mixed Concrete Association and ASTM C 94.

1.3 SUBMITTALS

A. Comply with the pertinent provisions of Section 01340.

B. Within 15 calendar days after receiving the Owner's Notice to Proceed, submit proposed mix designs for approval.

1. Proportions shall be determined by means of laboratory tests of concrete made with the cement and aggregate proposed for use.
2. Provide report in detail from an approved testing laboratory showing 7-day and 28-day strengths obtained using materials proposed.
3. Required average strength above specified strength:
   a. Determinations of required average strength above specified strength (f'c) shall be in accordance with ACI 318 and ACI 301.
4. Cost of this work shall be borne by the Contractor.

C. Manufacturer's data: Submit manufacturer's specification with application instructions for proprietary materials and items, including curing compound, form release agents, admixtures, patching compounds, and others as required by the Engineer.

1.4 PRODUCT HANDLING

A. Comply with pertinent provisions of Section 01640.

PART 2 - PRODUCTS

2.1 FORMS

A. Use form materials conforming to ACI 347.

B. Form coatings: Form release coating shall be neat oil with surface wetting agent or chemical release agent which effectively prevents absorption of moisture, prevents bonding with concrete, is non-staining to concrete and leaves the concrete with a paintable surface.

1. On surfaces to receive an applied coating, use a residual free chemical form release agent that is compatible with the applied coating and will not prevent the applied finish from satisfactorily bonding to the concrete.

2.2 SIDEWALK REINFORCEMENT

A. Fiber reinforcing:

1. Use fiber reinforcing where indicated on the drawings.
2. Provide polypropylene or co-polymer fibers as manufactured by High Tech Fibers, Inc., Fibermesh Company or an approved equal.
3. Where required, use fiber reinforcing at a rate of 2.0 lbs. per cubic yard unless another rate is indicated on the drawings.

B. Provide welded wire mesh for sidewalk reinforcement in compliance with ASTM A 185.

2.3 PREMOLDED JOINT FILLERS

A. In concrete pavements (exterior) and concrete sidewalks, use asphalt impregnated cellulose fiber joint fillers complying with ASTM D 1751.

2.4 CONCRETE MATERIALS

A. Cement: Use portland cement: ASTM C 150, Type I, Type I-P or Type II, low alkali.

B. Aggregates:

1. Fine aggregate: Conform to ASTM C 33.
2. Coarse aggregate: Conform to ASTM C 33, Size #57.

C. Water: Clean and potable and free from injurious amounts of deleterious materials.

D. Admixtures:

1. Air entraining admixture: ASTM C 260.
2. Water reducing, set controlling admixture: Conform to ASTM C 494.
   a. Type A - water reducing.
   b. Type D - water reducing and retarding.
3. Do not use admixtures containing calcium chloride.

E. Curing compounds:

1. On all vertical and formed surfaces and construction joints, use a non-residual, non-staining curing compound conforming to ASTM C 309 Type 1 and 1D. Acceptable products are:
   a. L&M Cure by L&M Construction Chemicals, Inc.
   b. Horn WB-75 by A.C. Horn Company.
   c. Sonosil by Sonneborn, Inc.
   d. Approved equal.

2.5 CONCRETE MIXES

A. Provide concrete with the compressive strength of 3000 psi for a 28-day strength as minimum:

B. Entrained air: 3000 psi concrete, 5% ±1%.

C. Slump: 3000 psi concrete, 4" ±1".

D. Production of concrete:

1. General: Concrete shall be ready mixed and shall be batched, mixed and transported in accordance with ASTM C 94 except as otherwise indicated.
2. Monitor time and mix proportions by plant delivery slips.
3. Air-entraining admixtures: Add air-entraining admixture into the mixture as a solution and measure by means of an approved mechanical dispensing device.
4. Water reducing and retarding admixture: Add water reducing and retarding admixture and measure as recommended by the manufacturer.
5. Addition of water to the mix upon arrival at the job site shall not exceed that necessary to compensate for a 1" loss in slump, nor shall the design maximum water-cement ratio be exceeded. Water shall not be added to the batch at any later time.
6. Weather conditions: Control temperature of mix as required by ACI 306 "Cold Weather Concreting" and by ACI 305 "Hot Weather Concreting".

PART 3 - EXECUTION

3.1 SURFACE CONDITIONS

A. Examine the areas and conditions under which work of this Section will be performed. Correct conditions detrimental to timely and proper completion of the Work. Do not proceed until unsatisfactory conditions are corrected.

B. Water, mud, organic, and other detrimental material shall be removed from excavations before concrete is deposited.

C. Notify the Engineer prior to placing concrete and place no concrete until the formwork, reinforcing and embedded items have been inspected by the Engineer.

3.2 FORMWORK

A. General:

1. Construct forms in conformance with ACI 347.
2. Provide formwork sufficiently tight to prevent leakage of cement paste during concrete placement.
3. Coat form contact surfaces with approved form coating compound prior to placing reinforcing steel.

B. Formwork reuse: Reuse only forms that are in good condition and which maintain a uniform surface texture on exposed concrete surfaces.

1. Apply a light sanding as necessary to obtain a uniform texture.

C. Removal of forms:

1. Do not disturb or remove forms until the concrete has hardened sufficiently to permit form removal with complete safety.
2. Exercise care in removing forms from finished concrete surfaces so that surfaces are not marred or gouged and that corners are true, sharp and unbroken.
3. Whenever the formwork is removed during the curing period, continue to cure the exposed concrete by one of the methods specified herein.

3.3 PLACING CONCRETE

A. Preparation:

1. Remove foreign matter accumulated in the forms.
2. Rigidly close openings left in the formwork.
3. Wet wood forms sufficiently to tighten up cracks. Wet other material sufficiently to maintain workability of the concrete.
4. Use only clean tools.
5. Provide and maintain sufficient tools and equipment on hand to facilitate uninterrupted placement of the concrete.
6. Before commencing concrete, inspect and complete installation of formwork and wire mesh.

B. Conveying:

1. Transport and handle concrete from the truck to the place of final deposit as rapidly as practicable by methods which will prevent segregation or loss of ingredients to maintain the quality of the concrete.

2. Provide equipment for lifting, dumping, chuting, pumping or conveying the concrete, of such size and design as to ensure a practically continuous flow of concrete at the delivery and without separation of materials.
3. Do not use concrete that is not placed within 1½ hours after water is first introduced into the mix unless the slump is such that it meets the specified limits without the addition of water to the batch.

C. Placing:

1. Deposit concrete as nearly as practicable in its final location so as to avoid separation due to rehandling and flowing.
2. Place concrete at such a manner that concrete upon which fresh concrete is deposited is still plastic.

D. Hot weather placement: Place concrete in hot weather in accordance with ACI 305 "Hot Weather Concreting" and as specified herein.

1. Do not place concrete whose temperature exceeds 100°F.
2. Thoroughly wet forms and reinforcing prior to placement of concrete.
3. Use additional set retarder as necessary to increase set time.
4. Start curing as soon as the concrete is sufficiently hard to permit without damage.

E. Cold weather placement: Place concrete in cold weather in accordance with ACI 306 and as specified herein.

1. Do not place concrete when the atmospheric temperature is below 40°F.
2. Do not add salts, chemicals, or other materials to the concrete mix to lower the freezing point of the concrete.

F. Consolidation:

1. Consolidate each layer of concrete immediately after placing, by use of internal concrete vibrators supplemented by hand spading, rodding, or tamping.
   a. Use vibrators having a 2" head diameter and a minimum frequency of 8000 vibrations per second.
   b. Provide sufficient number of vibrators to properly consolidate the concrete, keeping up with placement operations.
   c. Provide at least one spare vibrator on site.
2. Insert and withdraw vibrators at points approximately 18" apart.
3. Do not vibrate forms.
4. Do not use vibrators to transport concrete inside the forms.

3.4 PROTECTION

A. Protect the surface finish of newly placed concrete from damage by rainwater or construction traffic.

B. Do not apply design loads to structures until the concrete has obtained the specified strength.

3.5 CURING

A. Beginning immediately after placement, protect concrete from premature drying, excessively hot and cold temperatures and mechanical injury.

B. Curing compound: Apply curing compound immediately after completion of the finish on uniformed surfaces and within two hours after removal of forms on formed surfaces.

1. Spray the entire surface with two coats of liquid curing compound, applying the second coat in the direction of 90° to the first coat.
2. Apply compound in accordance with the manufacturer's instructions to cover the surface with a uniform film that will seal thoroughly.

3.6 CONCRETE FINISHING

A. Finish schedule: Unless otherwise indicated on the drawings, finish all concrete surfaces in accordance with the following schedule:

1. Form finish: Formed surfaces not ordinarily exposed to view, including the underside of slabs not exposed to view.
2. Broom finish: Exterior, outdoor slabs exposed to view including:
   a. Outdoor floor slabs and walkways.
   b. Other floors which may become wet or otherwise require a non-skid surface.
   c. Sidewalks and concrete pavements.
3. Edge finish: Exposed edges of slabs not receiving chamfer including:
   a. Sidewalk edges and joints.
   b. Pavement edges and joints.
   c. Other slab edges not chamfered.

B. Finishing procedures:

1. Form finish:
   a. Repair defective concrete.
   b. Fill depressions deeper than 1/4".
   c. Fill tie holes.
   d. Remove fins exceeding 1/8" in height.
2. Broom finish:
   a. Float finish as specified herein.
   b. Provide a scored texture by drawing a broom across the surface.
3. Edge finish: Tool slab edges and joints with a 1/4" radius edging tool.

3.7 SURFACE REPAIR

A. Patching mortar:

1. Make a patching mortar consisting of 1 part portland cement to 2-1/2 parts sand by damp loose volume.
2. Mix the mortar using one part acrylic bonding admixture to two parts water.

B. Surface defects:

1. Remove all defective concrete down to sound solid concrete.
2. Chip edges perpendicular to the concrete surface or slightly undercut, allowing no featheredges.
3. Dampen surfaces to be patched.
4. Patch defects by filling solidly with repair mortar.

C. Allow the Engineer to inspect the work before placing the patching mortar.

D. Repair defective areas greater than 1 sq. ft. or deeper than 1-1/2" as directed by the Engineer using materials approved by the Engineer at no additional expense to the Owner.

3.8 JOINTS

A. Construction joints:

1. Unless otherwise approved by the Engineer, provide construction joints every ten (10) feet, or as shown on the drawings.
2. Continue all reinforcing across construction joints and provide 1-1/2 " deep keyways unless indicated otherwise on the drawings.

B. Expansion joints:

1. Provide 1/2" expansion joints with premolded joint filters every thirty (30) feet.

3.9 FIELD QUALITY CONTROL

A. Concrete cylinder tests:

1. During construction, prepare test cylinders for compressive strength testing, using 6" diameter by 12" long single use molds, complying with ASTM C 31.
   a. Make a set of three test cylinders from each pour.
   b. Identify each and tag cylinder as to date of pour and location of concrete which it represents.
   c. Deliver cylinders to testing lab selected by the Owner.
   d. Cost for preparation and delivery of cylinders shall be borne by the Contractor. Cost for testing cylinders will be borne by the Owner.
2. Should strengths shown by test cylinders fail to meet specified strengths for the concrete represented, then:
   a. Engineer shall have the right to require changes in the mix proportions as he deems necessary on the remainder of the work.
   b. Additional curing of those portions of the structure represented by the failed test cylinders shall be accomplished as directed by the Engineer.
   c. Upon failure of the additional curing to bring the concrete up to specified strength requirements, strengthening or replacement of those portions of the structure shall be as directed by the Engineer.
   d. The Engineer may require additional testing of concrete in question by either non-destructive methods such as the Swiss Hammer, Windsor Probe or Ultrasonics or by coring and testing the concrete in question in accordance with ASTM C 42. Such testing shall be performed at no additional cost to the Owner.

B. Other field concrete tests:

1. Slump tests: A testing laboratory representative will make slump tests of concrete as it is discharged from the mixer.
   a. Slump test may be made on any concrete batch at the discretion of the Engineer.
   b. Failure to meet specified slump requirements will be cause for rejection of the concrete.
2. Temperature: The concrete temperature may be checked at the discretion of the Engineer.
3. Entrained air: Air content of the concrete will be checked by a representative of the testing laboratory at the discretion of the Engineer.

C. Coordination of laboratory services: The Contractor shall be responsible for coordination of laboratory services.

1. Maintain a log recording quantities of each type of concrete placed, date and location of pour.

2. Inform the testing laboratory of locations and dates of concrete placement and other information as required to be identified in the laboratory's test reports.

D. Tests required because of extensive honeycombing, poor consolidation of the concrete or any suspected deficiency in the concrete will be paid for by the Contractor.

E. Dimensional tolerances for allowable variations from dimensions or locations of concrete work, including the locations of embedded items shall be as given in ACI 301.

F. Concrete which fails to meet strength requirements, dimensional tolerances, watertightness criteria, or is otherwise deficient due to insufficient curing, improper consolidation or physical damage shall be replaced or repaired as instructed by the Engineer at no expense to the Owner.

3.10 MEASUREMENT AND PAYMENT

A. 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 project.

END OF SECTION

SECTION 02577

PAVEMENT MARKING AND SIGNAGE

PART 1 - GENERAL

1.1 DESCRIPTION

A. Work included: Prepare and paint the asphaltic concrete and/or concrete traffic or parking surfaces as indicated or specified and as needed for a complete and proper installation. This will include the following:

1. 24" wide, white stop lines at all stop signs.
2. White parking spaces.
3. Edge of pavement roadway markings.
4. Centerline roadway markings.
5. Median markings.

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 02513 - Asphaltic Concrete Paving.

1.2 QUALITY ASSURANCE

A. Referenced manufacturer is Sherwin Williams of Cleveland, OH. Equal products of other manufacturers may be provided upon approval by the Engineer.

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.

1.3 SUBMITTALS

A. Comply with pertinent provisions of Section 01340.

B. Product data: Within 15 calendar days after the Contractor has received the Owner's Notice to Proceed, submit:

1. Materials list of items proposed to be provided under this Section.
2. Manufacturer's specification and other data needed to prove compliance with the specified requirements.

1.4 PRODUCT HANDLING

A. Comply with pertinent provisions of Section 01640.

B. Deliver all material to site in original, new, unopened containers, labeled and bearing manufacturer's name, stock number, product, brand name, contents by volume for major constituents, instructions for mixing, reducing and application instructions.

C. Provide secure and adequate storage facilities for all materials stored on site.

PART 2 - PRODUCTS

2.1 PAINT MATERIALS

A. Within SCDOT roadway right-of-way provide thermoplastic pavement markings in accordance with Section 627 of the SCDOT's "Standard Specifications for Highway Construction" and latest revisions and supplements.

B. Outside SCDOT right-of-way provide permanent pavement markings, fast dry waterborne paint in accordance with Section 625 of the SCDOT's "Standard Specifications for Highway Construction" and latest revisions and supplements.

C. Provide colors as indicated on the plans and details or follow SCDOT standard specifications, if not shown on plans.

D. Provide reflective striping as specified or indicated on the plans containing properly graded glass spheres or beads.

2.2 REFLECTIVE GLASS BEADS

A. Reflective glass spheres shall be properly graded and conform to Section 625 and 627 of SCDOT's "Standard Specifications for Highway Construction" and latest revisions and supplements.

2.3 ROADWAY SIGNAGE AND STRIPING

A. Roadway signage and striping shall conform to the FHWA Manual on Uniform Traffic Control Devices for Streets and Highways, Latest Edition.

PART 3 - EXECUTION

3.1 SURFACE CONDITIONS

A. Surfaces to be painted are to be free of dirt, grease, oil and grit.

B. New asphalt surfaces are to be adequately cured before application of paint. Apply a test stripe in an inconspicuous area and allow for complete drying to determine readiness for painting.

3.2 ENVIRONMENTAL CONDITIONS

A. Do not apply paint when the temperature is below 50°F or when the relative humidity is above 85% or when the dew point is within 5°F of the surface temperature.

3.3 MATERIAL PREPARATIONS

A. Mix and prepare paint material in strict accordance with the manufacturer's recommendations.

B. When not in use, store materials in tightly covered containers.

C. Follow all manufacturers' safety, handling and disposal recommendations.

3.4 APPLICATION

A. Paint with mechanical equipment designed to apply traffic lane material with glass spheres in a uniform width with straight, neat edges.

B. Apply binder coat at the manufacturer's recommended rate but not less than 15 mils unless approved by the Engineer.

C. Glass spheres shall be applied, immediately after the striping paint has been applied, through a pressurized glass gun set 1" to 4" behind the paint spray gun. Other methods may be acceptable if approved by the Engineer.

D. Glass spheres shall be applied at the rate of 6 lbs. per gallon of binder paint.

3.5 PROTECTION OF FINISH

A. Provide temporary barriers and/or traffic control to prevent damage or traffic pick-up of paint until paint has dried to a state where no traffic pick-up occurs.

3.6 TOUCH UP

A. After complete drying of the initial paint application, touch up any damaged areas being careful to maintain uniform stripe alignment.

B. Remove or paint over in black any excess spray, spills, or traffic tracking of paint into areas not intended to receive paint.

3.7 MEASUREMENT AND PAYMENT

A. 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 project.

END OF SECTION

SECTION 02616

MILLING, CUTTING AND REPLACING PAVEMENTS

PART 1 - GENERAL

1.1 DESCRIPTION

A. Work included: Milling, cutting and replacement of existing pavements for installation of storm drainage lines, as specified herein, and as needed for a complete and proper installation of transitions to existing pavement at project boundaries.

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 02210 - Site Grading.
3. Section 02221 - Trenching, Backfilling for Utilities.
4. Section 02513 - Asphaltic Concrete Paving.
5. Section 02721 - Sewers: Storm Drainage.

1.2 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 for proper performance of the work of this Section.

1.3 SUBMITTALS

A. Comply with pertinent provisions of Section 01340.

1.4 PRODUCT HANDLING

A. Comply with pertinent provisions of Section 01640.

1.5 WARRANTY

A. All remove and replace pavement work within the South Carolina Department of Transportation (SCDOT) rights-of-way shall be warranted for two years beginning on the date of acceptance by the SCDOT.

PART 2 - PRODUCTS

2.1 ASPHALTIC CONCRETE

A. Comply with Section 02513.

2.2 AGGREGATE BASE COURSE WITH PRIME

A. Comply with Sections 02510 and 02513.

PART 3 - EXECUTION

3.1 GENERAL

A. Remove to neat lines and dispose of as directed.

B. Replace with bases and pavements as required by Sections 02510 and 02513 and the Construction Plans.

3.2 CUTTING

A. Asphalt pavement or base:

1. Cut on straight and true lines, to a minimum depth of 2", using powered concrete saw.
2. Shear off remaining depth with pneumatic tools.

B. Concrete sidewalks shall be removed back to the nearest joint on each side of the crossing.

C. Cut to straight and true lines with powered concrete saw.

3.3 MILLING

A. Use self-propelled milling equipment capable of maintaining accurate cut depth and slope and providing smooth cut edges.

B. Ensure the equipment can accurately and adequately establish profile grade and control cross slope.

C. Equip the milling machine with integral material pickup and truck discharges.

D. Ensure the milling machine has effective means for dust control.

E. Material size to comply with SCDOT specifications.

3.4 REPLACEMENT

A. Concrete sidewalks:

1. Replace with 4000 psi concrete.
2. Depth shall be equal to existing section removed, but not less than 4".
3. Finish surface to match existing sidewalk.

B. Flexible pavements:

1. Compact subgrade according to Section 02210 - Site Grading.
2. Undercut each edge 6" to form a shelf.
3. Replace with bases and pavements as required by Sections 02510 and 02513 and the Construction Plans.

3.5 MEASUREMENT AND PAYMENT

A. 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 project.

END OF SECTION

SECTION 02721

SEWERS: STORM DRAINAGE

PART 1 - GENERAL

1.1 DESCRIPTION

A. Work included: Provide storm drainage sewer as shown on the drawings, specified herein, and needed for a complete and proper installation.

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 02220 – Excavating, Backfilling for Structures.
3. Section 02221 - Trenching, Backfilling for Utilities.

1.2 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. All materials in this Section are to be manufactured in the United States.

C. Contractor to be certified by the manufacturer for installation of HDPE pipe.

1.3 SUBMITTALS

A. Comply with pertinent provisions of Section 01340.

B. Product data: Within fifteen (15) calendar days after the Contractor has received the Owner's Notice to Proceed, submit:

1. Materials list of items proposed to be provided under this Section.
2. Manufacturer's specifications and other data needed to prove compliance with the specified requirements.

1.4 PRODUCT HANDLING

A. Comply with pertinent provisions of Section 01640.

1.5 ORDER AND ACCEPTANCE OF WORK

A. Engineer shall direct on what line or street the Contractor shall work and the order thereof.

1. Generally, work shall commence at the lower end of a system and proceed upgrade.

1.6 PROTECTION OF OTHER UTILITIES

A. Location:

1. Approximate location of certain known underground lines is shown.

2. Existing small lines not shown.
3. Locate small and other possible utility lines using electronic pipe finder, or other approved method.
4. Excavate and expose existing underground utilities ahead of trenching operations.

B. Repair or replace any damaged utility line or structure at no additional cost to Owner.

1.7 CONFLICTING UTILITIES

A. Remove and/or relay conflicting utilities, when so directed by the Engineer, at the expense of the Owner.

B. Where alterations to existing utilities are shown to avoid conflicts, make alterations at no cost to Owner.

PART 2 - PRODUCTS

2.1 GENERAL

A. Pipe shall be subject to Engineer's observation, at plant, trench or other point of delivery, for culling and rejecting pipe, independent of laboratory tests, not conforming to specifications.

B. Rejected pipe will be marked by the Engineer and Contractor shall remove it from project site.

2.2 PIPE AND MATERIALS

A. Reinforced concrete pipe (RCP)

1. Pipe to comply with ASTM C-76 for Class III, Wall B (unless higher class is indicated on the drawings).
2. Furnish pipe with joints designed for flexible watertight gaskets.
3. Provide integral bell and spigot joints.
4. Provide gaskets on all pipe:
   a. O-ring rubber complying with ASTM C-443; or
   b. Preformed plastic gaskets complying with AASHTO Designation M-198 or Type B, Flexible Plastic Gasket.

B. High density polyethylene pipe (HDPE):

1. Manufacture from High Density Polyethylene (HDPE) virgin compounds conforming to cell classifications as listed in AASHTO M-252 and M-294, Type S, MP7-97 (Type D and DP).
2. Form with annular corrugation, conforming to AASHTO M-294.
   a. Furnish a Certificate of Compliance to the Engineer for each type of plastic pipe furnished.
   b. Provide integrated bell and spigot joints with ASTM F-477 rubber gasket on spigot end.

2.3 DRAINAGE STRUCTURES

A. Use precast concrete or built-in-place masonry units.

B. Precast drop inlets, catch basins, curb inlets, etc. shall be as manufactured by Tindall Concrete Products, Inc. or equal units by others.

C. All other precast structures (i.e., headwalls, flared end sections, etc.) shall be approved by Engineer prior to installation.

D. Inlet Castings.

1. Provide gray iron castings, complying with ASTM A-48, Class 35B iron and AASHTO M-306.
2. Provide a minimum recycled material content of 75 consisting of post-consumer material.
3. Provide uniform quality, free from sand holes, gas holes, shrinkage, cracks and other surface defects.
4. Grind smooth and clean by shot blasting.
5. Cast or machine bearing surfaces between grates and frames with such precision to prevent rocking.
6. Casting dimensional tolerances shall be +/- 1/16" per foot.
7. All published casting weights may vary no more than +/- 5%.
8. Conduct a first article proof load test and provide the results of that proof load upon request.
   a. Conduct in accordance with the method and procedure that is outlined in AASHTO M-306.
   b. Test on a suitable and calibrated load testing machine. Casting shall hold a 40,000 pound proof load for one minute without experiencing any cracks or detrimental permanent deformation.
   c. Test results for each lot of castings be maintained Foundry to for a minimum of seven years. Make available upon request.
9. Inspect in accordance with AASHTO M-306.
10. Furnish a foundry certification stating that samples representing each lot have been tested, inspected, and are in accordance with this specification.
11. Each casting shall be identifiable and show, at a minimum, the following: name of the producing foundry, country of manufacture, ASTM material designation, recycle symbol, individual part number, cast or heat date.
12. Castings shall include all lettering as shown on the specification drawings.
13. Patterns and weights shall be as indicated on the Contract Drawings.
14. Coat frames and covers with two (2) shop coats of water based bitumastic paint, MC4 MPFC by Molecular Coating Specialist of Cedar Hill, Texas or approved equal.
15. All castings are to be manufactured in the United States.

2.4 MANHOLES

A. Use precast manholes:

1. Provide reinforced precast concrete ring and eccentric cone sections complying with ASTM C-478 and the following.
2. Use portland cement complying with ASTM C-150, Type II.
3. Cast ladder rungs into the units.
4. Provide tongue and groove or o-ring rubber gasketed joints.
5. Use vulcanized butyl rubber sealant with tongue and groove joints.
6. Provide flat slab tops where manhole depth is less than 4'0".

B. Steps:

1. Provide polypropylene plastic steps reinforced with 3/8" diameter steel rod, M.S.A. Industries, Inc. Model PS-K, or equal.
2. Provide steps having non-skid top surfaces, safety slope at each end, minimum width of 10" and not less than 5" projection from wall.