

Bid & Contract Documents for:

Langley Pond Park, Phase 1

Prepared For:

Aiken County Government

1930 University Pkwy, Aiken, SC 29801

803-642-1500



August 28, 2020



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INVITATION TO BID

Aiken County Department of Engineering

Project Description: Aiken County is requesting Sealed Bids for

LANGLEY POND PARK, PHASE 1

improvements located at 113 Langley Dam Road in Aiken County. The project is as outlined in the attached Plans and Specifications. The Bids must be submitted as stated on the attached Aiken County Sealed Bid Document. Any question concerning the bid should be directed to procurement@aikencountysc.gov.

"The Bids must be received by mail or hand delivered to the Aiken County Procurement Department, Attn. Ms. Becky Dawes – Procurement Director, 1930 University Parkway, Room 3201, Aiken, SC 29801, at the specified time on the advertisement."

Plans, Specifications, and Contract Documents: Plans, Specifications, and Contract Documents may be obtained online at the link provided below. There will be a non-refundable \$0 per set deposit required for the Bid Documents. <https://www.aikencountysc.gov/Depts/PRC/PRCmain.php>.

Bid documents will be distributed via electronic digital PDF format only. Bidder assumed all liability for use of the electronic documents. Plan sheets are 30"x42" in dimension and the specifications and contract documents are 8.5" x 11" in dimension.

Owner Contact: All Contractors are instructed to direct all inquiries regarding this Bid to:
procurement@aikencountysc.gov.



A Mandatory Pre-Bid meeting shall be held per reference in the advertisement.

Special Conditions:

Conditions of Work: The Contractor must have informed himself fully of the conditions relating to the construction of this project and the employment of labor thereon, to have inspected the site, and to have read and become familiar with all the bid documents, contract documents, and plans/sketches. Failure or omission to do so will not relieve a successful bidder of his obligation to furnish all material, equipment, and labor necessary to carry out the provisions of his contract. Insofar as possible, the Contractor, in carrying out his work, must employ such methods and/or means as will not cause any interruption of or interference with the work of other contractors.

Restrictions: Contractor will need to work within the property limits shown on the plans. Coordination shall be through the County Engineer's Office.

Safety Devices: Contractor shall provide all needed traffic control, perimeter safety fence, barricades and signs for safety and remove trash and debris from the work area daily.

Damage to Property: Contractor shall be responsible for, and immediately take action to, repair or replace any damage adjacent to existing owner property for any reason.

Utilities: Any needed utilities shall be at the expense of the Contractor.

References: References shall be provided upon request to confirm that the successful bidder is capable of performing and completing this project in a timely manner under specified conditions.

Warranty Period: The warranty period for this project is one (1) year on labor and materials against defects and workmanship. This warranty period shall commence upon owner's final approval of the entire work.

Licenses & Permits: The Contractor is to obtain any licenses or permits required to perform this work at no additional expense to the Owner. A land disturbance permit will be provided to the successful bidder.

Insurance: Proof of Liability Insurance and Workmen's Compensation Insurance must be provided prior to commencing work.

Sketches: Sketches are provided for the purpose of bidding and not necessarily for detailed construction. All materials to be used are to be approved by the County Engineer prior to installation. In the case of an inconsistency between the sketches and specifications or within either document, the better quality or greater quantity of work shall be provided in accordance with the interpretation of the County Engineer.

Time of Completion: The time of completion is *(270) calendar days*, and availability of all items must be confirmed prior to commencing work. Liquidated damages are **five hundred (\$500.00) dollars** per calendar day. Written requests for additional time caused by unforeseen delays will be considered only if submitted in writing within ten (10) calendar days of event causing the delay. The work must commence on or before a date to be specified in a written "Notice to Proceed" from the Owner, and the project fully complete within the consecutive days thereafter, excluding major holidays.

Waiver of Lien: At the completion of the project, a Waiver of Lien (form provided by the County Engineer) shall be submitted to the County Engineer with the final Pay Request.

Security for Faithful Performance:

A Performance Bond of 100% of Bid and a Payment Bond for 100% of Bid shall be required. The Owner shall retain and hold ten (10) percent from each pay request until all work has been completed and approved by the County Engineer, and a Waiver of Lien submitted stating that all vendors have been paid for materials, labor, and supplies. See advertisement for Bid Bond Information.

ENGINEER

Alfred E Benesch
1005 Broad Street Ste 200
Augusta, Georgia 30901
Phone: 706-722-4114
Attention: Charles Hall, AICP, LEED AP BD+C

OWNER

Aiken County
1930 University Parkway
Aiken, SC 29801
Telephone: (803) 642-1535

Instructions to Bidders

1. **Intention:** It is intended that the Instructions to Bidders, Special Conditions, General Conditions, Detail Construction Specifications and Drawings shall cover the complete work to which they relate.
2. **Definitions:** Where the following words or pronouns used in their stead occur herein, they shall have the following meaning:

"Owner" shall mean AIKEN COUNTY, SOUTH CAROLINA, party of first part to the following agreement, or its authorized and legal representatives.

"Engineer" shall mean THE COUNTY ENGINEER FOR AIKEN COUNTY, S.C.

"Contractor" shall mean the party of the second part to the following agreement, or the legal authorized representatives of such party.
3. **Specifications Guidelines:** The work to be done consists of furnishing all materials and equipment and performing all labor necessary for completion of the work as set forth in the Bid, as shown on the Drawings, and as specified.
4. **Materials and Work by Owner:** The Owner will furnish and perform no labor for construction of the work under this contract except what is noted in the Special Conditions under "Work by County Forces."
5. **Contractor's License and Taxes:** Bidders must satisfy the requirements of all applicable South Carolina statutes, regulations and ordinances pertaining to bidders, contractors, licenses, permits, fees and taxes, including but not limited to Sections 40-11-10, et seq, Code of Laws of South Carolina, 1976, as amended. ***The General Contractor's License number must be shown in the space provided on the Bid Invitation and Bid Document.***
6. **Site Examination:** The Bidder is expected and directed to examine the location of the work and to inform himself fully as to the structural and mechanical conditions; the conformation of the ground; the soil conditions; the character, quality and quantity of the materials to be encountered; the character of equipment and facilities needed preliminary to and during the prosecution of the work; the general and local conditions; and all other matters which can in any way affect the work to be done.
7. **Sub-Surface Conditions:** A sub-surface investigation has been performed and is made part of this document package. The contractor shall include in his bid all cost of excavation and removal and replacement of unsuitable materials. The contractor shall make his own analysis of the materials to be encountered, and include prices for removal and replacement of these materials in his unit prices for construction unless allowances for removal and replacement are provided in the Bid.

8. **Bids:** All Bids must be made upon the Bid Document forms hereto annexed and shall be for materials and work shown on the Drawings and/or specified. Bid forms shall not be detached from the bound documents. Bid prices must be stated for each item on the Bid Form. Documents are to be enclosed in a sealed envelope, addressed to:

AIKEN COUNTY GOVERNMENT
ATTN: PROCUREMENT DEPARTMENT
1930 UNIVERSITY PARKWAY, SUITE 3201
AIKEN, SOUTH CAROLINA 29801

If forwarded by mail or courier, the sealed envelope containing the Bid shall be enclosed in another envelope or courier container also addressed as specified.

- (a) **Unit Price Items:** The itemized quantities given in the Bid for unit price work shall be considered by the Contractor as the quantities required to complete the work. When the actual quantities required in the construction of the work are greater than or less than the quantities shown in the items, the amount equal to the difference in quantities at the unit prices bid for amount shall be paid.
- (b) **Lump Sum Prices:** Where itemized prices are not given in the Bid, the Contractor shall consider the lump sum prices bid for the work shown on the Drawings and/or specified to be sufficient for completion of his Contract.
- (c) **Add Alternates:** A list of Add-Alternate items is included in this package. The bidder shall complete the document in full for the additive item(s) noted.
- (d) **Deductive Alternates:** A list of Deductive-Alternate items is included in this package. The bidder shall complete the document in full for the deductive item(s) noted.
- (e) **Total Amount Bid:** The correct total amount bid is defined as the correct sum total of the amount bid for the items in the Bid. The correct amount bid for each unit price item is defined as the product of the quantity listed in the Bid for the item, multiplied by the unit price bid.
- (f) **Schedule of Values:** See section **004373** for the required **Schedule of Values** Form.
9. **Extra Work Items in the Bid:** The Bid may contain certain unit price items entitled "Extra Work, If Ordered by the Engineer". In each such item, the estimated quantity is based on the average amount of extra work encountered in a typical job. The stated quantities are not guaranteed but are included in the Bid in order to determine, in advance of construction, the actual low Bidder. No work included in such items will be authorized for payment without advance authorization of the work by the Engineer.
10. **Bid Security and Bonds:** A Bid Bond shall be required in an amount equal to not less than five per cent (5%) of the amount of the bid to guarantee that the successful bidder will,

within ten (10) days from the date of the notice of awarded Contract, enter into a contract with the Owner, and execute to the Owner a Performance Bond and Payment Bond, the contract and bonds to be in the form set forth in this book. If, for any reason whatever, the Bidder withdraws from the competition after the bids have been opened, or refuses to execute the required contract and bonds, if his bid is accepted, the Owner may retain the amount of the certified check, or proceed against the bid bond. The surety on the Bid Bond and Performance and Payment Bonds shall be a surety company authorized to do business in the State where the project is located. Attorneys-in-fact certified, proper and effectively dated copy of their power of attorney. Performance and Payment Bonds shall be countersigned by an agent residing in the State, County, or City of the Owner, if required. Bonds and the surety thereon shall be subject to approval by the Attorney for the Owner.

11. **Bids Opened in Public:** Bidders are invited to be present at the opening of Bids, which will be in public.
12. **Right to Reject Bids:** The Owner reserves the right to reject any or all bids and to waive informalities. No bids will be received after the time set for opening Bids. Any Bidder may change or withdraw his bid, either personally or by telegraphic or written request, at any time prior to the scheduled closing time for receipt of bids, but no bid shall be changed or withdrawn by telegraph or mail received after the time set for opening Bids.
13. **Determination of Low Bid:** The contract will be awarded, if it is awarded, to the responsible and responsive Bidder or Bidders submitting the lowest bid. The Owner, in its sole discretion, will decide which is the lowest responsible and responsive Bidder. In determining a responsible Bidder, the following elements, among other things, may be considered: whether the Bidder involved (a) maintains a permanent place of business; (b) has adequate plant equipment to do the work properly and expeditiously; (c) has a suitable financial status to meet obligations incident to the work; and (d) has appropriate technical experience on projects of similar scope and types of work and experienced, qualified personnel. In determining a responsive Bidder, the following elements will be considered: (a) the completeness and regularity of the Bid Form; (b) Bid Form without excisions or special conditions, and, (c) a Bid Form having no alternative bids for any items unless requested in the technical specifications.
 - (a) The Bidder, if requested by the County Engineer, shall list prices of at least two manufacturers of each item of major equipment if listed on the Bid Form. Use lowest price for base bid. If the “make” of any item listed in the base bid column does not meet specifications, the next lowest priced “make” listed for that item which does meet specifications will be used in determining the lowest bid price. If all of the listed “makes” of the item fail to meet specifications, as determined above, the Bidder will be so notified and he may, within 48 hours of such notification, submit a make or makes of equipment which will meet the specification for the base price originally listed in the Bid. Otherwise, the Bid will be rejected on the grounds that it is non-responsive.

(b) The Owner has the right to apply any or all "Deductions or Additions", if any, listed in the Bid by the Engineer, for the purpose of making an award.

14. **Return of Bid Security:** Subject to the provisions of paragraph 10, the Owner will, within ten (10) days following the Bid opening date, return the certified check of all Bidders, except the certified checks posted by the three lowest Bidders; upon final award and execution of the Contract, the remaining certified checks will be promptly returned. Bid Bonds will not be returned unless requested.
15. **Interpretation of Drawings and Specifications:** If any person contemplating submitting a bid for the project is in doubt as to the true meaning of any part of the Drawings, Specifications, or other Contract Document, or as to the scope of any part of the work, he shall submit to the Engineer a written request for an interpretation thereof. The person submitting the request will be responsible for its prompt delivery in ample time for an interpretation to be issued before bid opening date. Interpretations of the documents will be made only by Addendum, and a copy of that Addendum will be mailed or delivered to each person receiving a set of the documents. The Owner and Engineer will not be responsible for other interpretations of the documents.
16. **Complete Work Required:** The Specifications, the Drawings and all supplemental documents are essential parts of the Contract, and requirements occurring in one are as binding as though occurring in all. They are intended to be complementary and to describe and provide for the complete work. In case of omissions from the Specifications as to items of equipment and materials or quantities therefore, the Drawings shall govern. In case of discrepancy in the Drawings, figured dimensions shall govern. It shall be the responsibility of the Bidder to call to the attention of the Engineer those omissions having a magnitude, which would affect the strength, adequacy, function, completeness and cost of any part of the work in ample time for amendment by Addendum prior to the Bid opening date.
17. **Drawings:** The character and location of the work, together with the essential details, are shown upon the Drawings.
18. **Submittals:** Submittals shall consist of those detail drawings which may be required for prosecution of the work, but which are not included in the Contract Drawings. DIGITAL copies of all necessary Submittals shall be submitted by the Contractor to the Engineer unless additional copies are included in the submittal. Submittals shall include shop details of manufactured equipment, products to be used, and all other drawings as may be required by the Specifications, and as may be necessary for the successful completion of the work. Review and approval by the County Engineer must be obtained before work involving working drawings may be performed.
 - (a) **Check by Contractor:** The Contractor shall check all working drawings for accuracy of dimensions and details, and for conformance with Contract Drawings and Specifications before submitting Submittals to the Engineer for review. The

Contractor shall indicate that Submittals have been checked by affixing an appropriate stamp or notation on the face of the Submittals. Deviations from the Plans and Specifications shall be clearly and specifically called to the Engineer's attention in a written statement accompanying the drawings.

(b) **Responsibility for Accuracy:** Review by the Engineer of the Contractor's Submittals shall not relieve the Contractor of responsibility for accuracy of dimensions and details. The Contractor shall be responsible for agreement and conformity of Submittals with the Contract Drawings and Specifications.

(c) **Payment:** The contract price shall include the cost of furnishings all Submittals, and the Contractor shall be allowed no extra compensation for furnishing those drawings.

19. **Cooperation of Contractor:** The Contractor will be supplied with two (2) copies of the Drawings and Specifications and a digitized set of documents. The Contractor shall have available on the work, at all times, one (1) copy of the Drawings and Specifications. He shall give the work the constant attention necessary to facilitate the progress thereof and shall cooperate with the Engineer and other contractors in every way possible. It is the SOLE responsibility of the contractor to provide ALL necessary plans, pages, specs, details, dimensions, etc to every subcontractor for all elements of the project. Failure to do so may result in the work being rejected at the contractor's expense.
20. **Construction Stakes:** Subsidiary lines and grades shall be laid out by the Contractor from the controlling lines and benchmarks established by the Engineer, or from measurements shown. All lines and grades shall be subject to checking by the Engineer, but that checking shall in no way relieve the Contractor from responsibility for their labor and assistance as the Engineer may require in laying-out work, establishing bench marks, and checking and measuring the work. **All control to be established by a surveyor licensed in the state of South Carolina.**
21. **Authority and Duties of Inspector:** Inspectors shall be authorized to inspect all work done and all materials furnished, including preparation, fabrication, and manufacture of the materials to be used. The inspector shall not be authorized to alter or waive requirements of the Drawings and Specifications. He shall call the attention of the Contractor to failure of the work and/or materials to conform to the Drawings and Specifications. He may reject materials or suspend work until questions at issue can be referred to and be decided by the Engineer. The presence of the inspector shall in no way lessen the responsibility of the Contractor.
22. **Inspection:** The Contractor shall furnish the Engineer with every reasonable facility for ascertaining whether or not the work performed, and materials used are in accordance with the requirements and intent of the Specifications and Drawings. No work shall be done or materials used without suitable supervision or inspection by the Engineer or his representative. Failure to reject defective work and materials shall neither, in any way, prevent later rejection when those defects are discovered, or obligate the Owner to any final acceptance.

23. **Rejection of Work and Materials:** All materials furnished, and work done when not in accordance with the Specifications and Drawings will be rejected, shall be immediately removed, and other work shall be done and materials furnished in accordance therewith.

If the Contractor fails to remove the work and materials within forty-eight (48) hours after having been ordered to do so, then the Owner shall have the right and authority to stop the Contractor and his work at once until the Contractor removes the work and materials.

24. **Defective Materials and Work:** The inspection of the work shall not relieve the Contractor of any of his obligations to fulfill the Contract. Defective work shall be made good by the Contractor, notwithstanding that such work and materials have been previously inspected by the Engineer and accepted or estimated for payment. Failure by the Engineer to condemn or reject improper materials and workmanship shall be considered neither as a waiver of defects, which may be discovered late, nor as preventing the Owner at any time subsequently from recovering damages for work actually defective. All work shall be guaranteed against defects in workmanship and materials for a minimum period of one year from date of Owner acceptance.
25. **Corrections:** Should any portion of the Drawings and specifications be obscure or in dispute, they shall be referred to the Engineer, and he shall decide as to the true meaning and intent. He shall also have the right to correct errors and omissions at any time when those corrections are necessary for the proper fulfillment of the Drawings and Specifications.
26. **Disagreement:** Should any disagreement or difference arise as to the estimate, quantities, or classifications, or as the meaning of the Drawings and/or Specifications, on any point concerning the character, acceptability, and nature of the several kinds of work and materials and construction thereof, the decisions of the Engineer shall be final, conclusive, and binding upon all parties to the Contract.
27. **Weather:** During unseasonable weather, all work must stop when the Engineer so directs, and all work must be suitably protected.
28. **Land and Rights-of-Way:** The Owner will furnish all land and rights-of-way necessary for the carrying out of this contract and the completion of the work herein contemplated and will use due diligence in acquiring said land and rights-of-way as speedily as possible. It is possible that all lands and rights-of-way may not be obtained as herein contemplated before construction begins, in which event the Contractor shall begin his work upon such land and rights-of-way as the Owner may have previously acquired. The Owner will provide no right-of-way over other property. The Contractor shall take every precaution to inconvenience as little as possible the owners or tenants of adjacent property. Public Highways shall not be obstructed. Expense shall be borne by the Contractor to repair or pay for any damage or injury to either private or public property during progress of the work.
29. **Competent Labor:** The Contractor shall employ only competent and skilled personnel on the work. The Contractor shall at all times have a Superintendent, satisfactory to the Engineer, capable of acting as the Contractor's agent of the work, and who shall receive instructions from the Engineer or his authorized representative. The Superintendent shall have full authority to execute the orders and directions of the Engineer without delay, and to promptly supply these materials, tools, plant equipment, and labor as may be required. The Contractor shall, upon demand by the Engineer, immediately remove that

Superintendent, Foreman, and Workmen whom the Engineer may consider to be incompetent or undesirable, or both.

30. **Laws, Regulations, and Permits:** The Contractor shall comply with all applicable laws, ordinances, and the rules and regulations of all authorities having jurisdiction over construction of the work specified herein. Permits and licenses necessary for construction of the work shall be secured and paid for by the Contractor.
31. **Sales Tax:** Bidders shall include in the Bid an allowance for payment of State Sales Tax on all taxable materials specified to be furnished by the Contractor and incorporated into the work under this Contract.
32. **Sanitary Facilities:** Necessary sanitary facilities for the use of personnel on the work shall be erected and maintained by the Contractor in such manner and at such points as shall be approved by the Engineer. Facilities shall be maintained in sanitary conditions and in strict accordance with the applicable regulations. No unsanitary act shall be committed outside sanitary facilities.
33. **Storage Facilities:** Should the Contractor so desire, he may build storage facilities for housing tools, machinery and supplies, but those facilities will be permitted only at places approved by the Engineer, and their surroundings shall be maintained at all times in a sanitary and satisfactory manner. On or before completion of the work, those facilities shall be removed at the expense of the Contractor.
34. **Water, Sewer, and Electric Power Supply:** The Contractor shall make his own arrangements for water, sewer, and electric power supply for his construction operations.
35. **Access Roads:** Streets, roads and drives used by the Contractor for access to and from the job site shall be protected from damage in excess of that caused by the normal traffic of vehicles used for, or in connection with, construction work. Project-related damages shall be repaired immediately, and the area shall be left in good condition at the end of the construction period.
36. **Order of Work:** The prosecution, order and sequence of the work shall be as provided herein, or as approved by the Engineer, but that approval shall in no way affect the responsibility of the Contractor.
37. **Protective Works:** The Contractor shall furnish and install all necessary temporary signage for the protection of the work, including lights at night, barricades, and warning signs.
38. **Safety Regulations:** The performance of work under this Contract shall comply with safety regulations prescribed by the Owner, those of the National Occupational Safety and Health Act of 2011, and the requirements of the State where project is located. Each Bidder shall examine and satisfy himself as to the character and extent of these regulations.

39. **Allowable Time for Completion:** The time allowed for completion of all work as stated in the Bid and Construction Agreement shall be as specified in consecutive calendar days after notifications by written order from the Engineer to proceed with the work. Such notifications will be issued upon completion of execution of the contract documents.

40. **Liquidated Damages:** The Contractor shall pay to the Owner as liquidated damages the sum of five hundred dollars (\$500.00) for each calendar day that the Contractor shall be in default of completing the work within the time limit stated within the Bid.

END INSTRUCTION TO BIDDERS

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GENERAL CONDITIONS

1. **Contract Security:** The Contractor must furnish two Security Bonds (forms attached) each in an amount at least equal to one hundred percent (100%) of the contract price, one as a security for the faithful performance of this Contract and one for the payment of all persons performing labor and furnishing materials in connection with this Contract. The Surety on each Bond must be a surety company satisfactory to the Owner, duly authorized to do business in the State of South Carolina. The Bonds must be countersigned by an agent who is a resident of the State, County or City of the Owner, if required. The person executing the Bond on behalf of the surety must file with the Bond a general power of attorney unlimited as to amount and type Bond covered by such power of attorney, and certified to by an official of said surety.

2. **Contractor's and Subcontractor's Insurance:** The Contractor must not commence work under this Contract until he has obtained all the insurance required under this paragraph and such insurance has been approved by the Owner, nor shall the Contractor allow any subcontractor to commence work on his subcontract until all similar insurance required of the subcontractor has been so obtained and approved. All certification of insurance and policies must contain the following clause: "The insurance covered by this Certificate will not be canceled or materially altered unless at least thirty (30) days prior written notice has been given to the Owner".

(a) **Compensation Insurance:** The Contractor must procure and must maintain during the life of this Contract, including the entire period of the Contractor's Warranty, Workmen's Compensation Insurance for all of the employees engaged, or to be engaged, in work on the project under this Contract; and in any case any such work is sublet, the Contractor must require the subcontractor similarly to provide Workmen's Compensation Insurance for all of the latter's employees engaged, or to be engaged, in such work unless such employees are covered by the protection afforded by the Contractor's Workmen's Compensation Insurance. In case any class of employees engaged in hazardous work on the project under this Contract is not protected under the Workmen's Compensation Insurance Statute, the Contractor must provide Workmen's Compensation coverage for and hold harmless the Owner for the protection of such of his employees not otherwise protected.

(b) **Public Liability, Property Damage, and Automobile Liability Insurance:** The Contractor must take out, and maintain during the life of this Contract, including the entire period of the Contractor's Warranty, Comprehensive General Liability Insurance, including products and completed operations, XC and U coverage; the ISO Broadform General Liability endorsement to its equivalent thereof; Automobile Liability Insurance; and such other insurance as the Owner may direct and must protect him and any subcontractor performing work covered by this contract from claims for damage for personal injury, including accidental death, as well as from claims for property damage, which may arise from operations under this Contract, whether such operations be by the insured or by anyone directly or indirectly employed by them. The Owner must be listed as an additional Insured on all such policies and certificates of insurance. The amount of such insurance must be as follows:

(1) **Bodily Injury Insurance** in an amount of not less than \$500,000 for bodily injury, including accidental death to any one person, and subject to the same limit for each person, in an amount not less than \$1,000,000 on account of one accident.

(2) **Property Damage Insurance** in an amount not less than \$500,000 for any one damage claim, and in an aggregate amount up to \$1,000,000 during a period of twelve (12) months.

(3) **Automobile Liability Insurance:**

- a. For bodily injury, including accidental death to any one person in an amount not less than \$500,000 and subject to the same limit for each person, in an amount not less than \$1,000,000 on account of one accident.
- b. For property damage in an amount not less than \$500,000 for any one damage claim and in an aggregate amount up to \$1,000,000 during a period of twelve (12) months.
- c. **Owner's Protective Liability Insurance:** The Contractor must provide a policy issued in the name of the Owner for liability and property damage in the same amounts as required for the Contractor.
- d. **Umbrella Policy:** Umbrella coverage must be obtained if required, to provide for an increase in basic policy coverage to an amount not less than \$1,000,000.
- e. **Builder's Risk or Installation Floater Insurance (Fire and Extended Coverage):** The Contractor must insure all work against loss or damage by fire and against loss or damage covered by the standard extended coverage insurance, and the amount of the insurance at all times must be at least equal to the amount paid on account of work and materials. The policies must be in the names of the Owner and the Contractor as their interests may appear.
- f. **Proof of Coverage of Insurance:** The Contractor must furnish the Owner with certificates showing satisfactory proof of carriage of the insurance required before commencing work on this contract. Certificates of insurance for subcontractors are not required to be submitted to the Owner.
- g. **Scope of Insurance:** The insurance required under sub-contractors (b), (c) and (d) hereof must provide protection for the Contractor and his subcontractors respectively, as well as the Owner, against damage claims which may arise in any way from operations under this Contract, whether such operations be by the insured or by anyone directly or indirectly employed by him.
- h. Nothing contained in this contract or any document forming a part hereof or attached thereto, shall be construed to, change or increase the limitations on the liability of the Owner set forth in the South Carolina Tort Claim Act.

3. **Accident Prevention:** Precaution must be exercised at all times by the Contractor for the protection of all persons, including employees and property. Hazardous conditions must be guarded against or eliminated.

The Contractor shall be responsible for all injuries or damages to persons or property, and shall defend, indemnify, save and hold harmless the Owner, its officers, employees and agents, from all damages, attorneys' fees and costs by reason of injury to person or property resulting from performance of the work or in guarding the same, or from any improper materials, implements, or appliances used in its construction, or on account of any act or omission of the Contractor and sub-contractor, their agents or employees. The whole or as much of the monies due under, and by virtue, of this Contract as may be considered necessary by the Owner shall or may be retained by the Owner until all suits or claims for damages shall have been settled, and evidence to that effect furnished to the satisfaction of the Owner.

(a) In emergencies affecting the safety of persons, the work or property at the site or adjacent thereto, the Contractor without special instruction or authorization from the Engineer or Owner, must act to prevent threatened damage, injury or loss. The Contractor must make prompt written notice to the Engineer and Owner of any changes in the work or deviations from the Contract Documents caused thereby.

(b) Safety and health facilities and procedures must be in accordance with the requirements of the National Occupation Safety and Health Act of 1970, (OSHA), and subsequent amendments. The Contractor must comply with the Department of Labor's Safety and Health Regulations for construction promulgated under the National Occupational Safety and Health Act of 1970 (P.L. 91-596), and under Section 107 of the Contract Work Hours and Safety Standard Act (P.L. 91-54), and subsequent amendments. The Contractor must comply with OSHA Hazard Communication Standard, Title 29 Code of Federal Regulations 1910.1200, by compiling a master hazardous chemical list (including locations), expanding MSDS's, ensuring that containers are labeled, and providing employee training.

4. **Laws of the Place:** The Contractor must conduct the construction as defined in the Bid in accordance with the applicable national, state, county, and municipal laws, ordinances and regulations. The Contractor must keep himself fully informed of those laws, ordinances, and regulations which would, in any way, affect those engaged and employed in the project, the materials used in the project, and the conduct of the project; and informed of all orders and decrees of bodies and tribunals having jurisdiction and authority over the project. If discrepancies, or inconsistencies, or both, should be discovered in the Construction Agreement, Drawings, or Construction Specifications, or combination thereof, in relations to laws, ordinances, regulations, orders and decrees, the Contractor must forthwith report the fact, in writing, to the Owner. The Contractor must protect and indemnify the Owner, his officers, agents and employees, against claims and all liabilities arising from, or based on, the violation of those laws, ordinances, regulations, orders, and decrees, whether by the Contractor or by his employees or agents.

5. **Payment of Contractor:**

(a) Not later than 30 days after pay requests are promptly and properly submitted, the Owner will make a partial payment to the Contractor on the basis of a duly certified and approved estimate of the work performed during the preceding performance of this Contract.

The Owner will retain ten percent (10%) of the amount of each estimate until such time that all work has been completed and approved by the County Engineer and a Waiver of Lien submitted stating that all vendors have been paid for materials, labor and supplies.

(b) In preparing estimates, the material not subject to deterioration delivered on the site and preparatory work done will be taken into consideration for inclusion on the partial payment request. The amount of eligible on-site material included in the partial payment shall be reduced by ten percent (10%) of the amount of the material cost as shown on the submitted material invoice.

(c) All material and work covered by partial payments made shall thereupon become the sole property of the Owner, but this provision must not be construed as relieving the Contractor from the sole responsibility for the care and protection of materials and work upon which payments have been made or the restoration of any damaged work, or as a waiver of the right of the Owner to require the fulfillment of all of the terms of the Contract.

(d) **Owner's Right to Withhold Certain Amounts and Make Application**

Thereof: The Contractor agrees that he will indemnify and save the Owner harmless from all claims growing out of the demands of subcontractors, laborers, workers, mechanics, material men, and furnishers of machinery and parts thereof, equipment, power tools, and all supplies including commissary, used in the furtherance of the performance of this contract. The Contractor must furnish satisfactory evidence that all obligations of the nature hereinabove designated have been paid, discharged, or waived. If the Contractor fails so to do, then the Owner may, after having served written notice on the said Contractor, either pay unpaid bills, of which the Owner has written notice, directly, or withhold from the Contractor's unpaid compensation a sum of money deemed reasonably sufficient to pay any and all such claims until satisfactory evidence is furnished that all liabilities have been fully discharged, whereupon payment to the Contractor shall be resumed, in accordance with the terms of this Contract; but in no event shall the provisions of this sentence be construed to impose any obligations upon the Owner to either the Contractor or his Surety. In paying any unpaid bills of the Contractor, the Owner shall be deemed the agent of the Contractor, and the Owner shall not be liable to the Contractor for any such payments made in good faith.

6. Payment by Contractor: The Contractor shall pay

(a) For all transportation and utility services no later than 20 days following that month in which services are rendered;

(b) For all materials, tools, and other expandable equipment not less than ninety percent (90%) of the cost thereof, no later than 20 days following that month in which such materials, tools, and equipment are delivered at the site of the project; and

(c) To each of his subcontractors, no later than the 5th day following each payment to the Contractor, the respective amounts allowed the Contractor on account of the work performed by his subcontractors to the extent of such subcontractors' interest therein.

7. Subcontracting:

(a) The Contractor may utilize the services of specialty sub-contractors on those parts of the work which, under normal contracting practices, are performed by specialty subcontractors.

(b) The Contractor must not subcontract the complete work, or any major portion thereof, and must not award any work to any subcontractor without prior written approval by the Owner, which approval will not be given until the Contractor submits to the Owner, a written statement concerning the proposed award to the subcontractor, which statement must contain such information as the Owner may require.

(c) The Contractor shall be as fully responsible to the Owner for the acts and omissions of his subcontractors, and of persons either directly or indirectly employed by them, as he is for the acts and omissions of persons directly employed by him.

(d) The Contractor must cause appropriate provisions to be inserted in all subcontracts relative to the work to bind sub-contractors to the Contractor by the terms of the General Conditions and other Contract Documents insofar as applicable to the work of subcontractors, and to give the Contractor the same power as regards terminating any subcontract that the Owner may exercise over the Contractor under any provisions of the Contract Documents.

(e) The Contractor must indemnify and save the Owner and the Owner's agents harmless from all claims growing out of the lawful demands of subcontractors, laborers, workmen, mechanics, material men, and furnishers of machinery and parts thereof, equipment, tools and all supplied, incurred in the furtherance of the performance of the work.

(f) Nothing contained in this Contract shall create any contractual relationship between any subcontractor and the Owner.

8. **Assignments:** The Contractor must not assign the whole or any part of this Contract, or any monies due, or to become due hereunder without written consent by the Owner. In case the Contractor assigns all, or any part of any monies, or to become due under this Contract, the instrument of assignment must contain a clause substantially to the effect that it is agreed that the right of the assignee in and to any monies due, or to become due, to the Contractor shall be subject to prior liens of all persons, firms, and corporations for service rendered or materials supplied for the performance of the work called for in this Contract.

9. **Time for Completion and Liquidated Damages:**

(a) It is hereby understood, and mutually agreed, by and between the Contractor and the Owner, that the date of beginning, rate of progress, and the time for completion of the work to be done hereunder are ESSENTIAL CONDITIONS of this contract; and it is further mutually understood and agreed that the work embraced in this Contract shall be commenced on a date to be specified in the "Notice to Proceed" and completed within the time period specified herein above. The Contractor agrees that said work shall be prosecuted regularly, diligently, and uninterruptedly at such rate of progress as will insure full completion thereof within the time specified. It is expressly understood and agreed, by and between the Contractor and the Owner, that the time for completion of the work described herein is a reasonable time for the completion of same, taking into consideration the average climatic range and usual industrial conditions prevailing in this locality.

(b) IF THE SAID CONTRACTOR SHALL NEGLECT, FAIL OR REFUSE TO COMPLETE THE WORK WITHIN THE TIME HEREIN SPECIFIED, then the Contractor does hereby agree, as a part consideration for the awarding of this Contract, to pay to the Owner the amount specified in the Contract not as a penalty, but as liquidated damages for such breach of Contract as hereinafter set forth, for each and every calendar day that the Contractor shall be in default after the time stipulated in the Contract for completing work. The said amount is fixed and agreed upon by and between the Contractor and the Owner because of the impracticability and extreme difficulty of fixing and ascertaining the actual damages which the Owner would in such event sustain, and said amount is agreed to be the amount of damages which the Owner would sustain.

(c) It is further agreed that time is of the essence of each and every portion of this Contract and of the specifications wherein a definite and certain length of time is fixed for the performance of any act whatsoever; and where an additional time is allowed under the contract for the completion of any work, the new time limit fixed by such extension shall be of the essence of this Contract.

(d) The Contractor shall not be charged with liquidated damages or any excess cost when the delay in completion of the work is due:

- i. To any preference, priority, or allocation order duly issued by the government.
- ii. To unforeseeable cause beyond the control and without the fault or negligence of the Contractor, including, but not restricted to, acts of God, or of the public enemy, fires, floods, epidemics, quarantine restrictions, strikes, freight embargoes and unusually severe weather.
- iii. To any delays of subcontractors occasioned by any of the causes specified in subsections (a) and (b) of this article.

Provided that within seventy-two (72) hours from the beginning of such delay, the Contractor must notify the Owner in writing of the causes of the delay. The Owner, shall then ascertain the facts and the extent of the delay and notify the Contractor within a reasonable time of its decision in the matter.

10. Construction Schedule and Periodic Estimates:

(a) Immediately after execution and delivery of the Contract, and before the first partial payment is made, the Contractor must deliver to the Owner an estimated construction progress schedule in a form satisfactory to the Owner, showing

- i. The proposed dates of commencement and completion of each of the various trades of work required under the Contract Documents and
- ii. The anticipated amount of each monthly payment that will become due to the Contractor in accordance with the progress schedule.

- (b) The Contractor must also furnish on forms acceptable to the Owner:
 - i. A detailed estimate giving a complete breakdown of the Contract price and
 - ii. Periodic itemized estimates of work done for the purpose of making partial payments thereon.

The costs employed in making up any of these schedules will be used for determining the basis of partial payments and will not be considered as fixing a basis for additions to or deductions from the contract price.

11. Responsibility of Contractor: If, through acts of neglect on the part of the Contractor, any other Contractor, or any subcontractor shall suffer loss or damage on the work, the Contractor agrees to settle with such other contractor or subcontractor by agreement or arbitration if such other contractor or subcontractor will so settle. If such other contractor or subcontractor shall assert any claim against the Owner on account of any damage alleged to have been sustained, the Owner shall notify the Contractor, who must defend and indemnify and save and hold harmless the Owner against any such claim.

12. Extras: Without invalidating the Contract, the Owner may order extra work or make changes by altering, adding to or deducting from the work, the Contract sum being adjusted accordingly, and the consent of the Surety being first obtained where necessary or desirable. All work of the kind bid upon shall be paid for at the price stipulated in the Bid, and no claims for any extra work or materials shall be allowed unless the work is ordered in writing by the Owner or the Engineer, acting officially for the Owner, and the price is stated in such order.

13. Changes in Work:

(a) Should the Contractor encounter, or the Owner discover, during the progress of the work, subsurface or latent conditions at the site materially differing from those shown on the Drawings or indicated in the Specifications, or unknown conditions of an unusual nature differing materially from those ordinarily encountered and generally recognized as inherent in work of the character provided for in the Drawings and Specifications, the attention of the Owner shall be called immediately to such conditions before they are disturbed. The Owner must thereupon promptly investigate the conditions, and if it finds that they do so materially differ, the Contract shall be modified, with the written approval by the Owner, to provide for any increase or decrease of costs or difference in time resulting from such conditions. No changes in work shall be made without prior written approval by the Owner.

(b) The Contractor must proceed with the performance of any changes in the work so ordered in the field by the Engineer and/or Owner unless the Contractor believes said change entitles him to a change in Contract price and/or time, in which event the Contractor must give the Engineer written notice thereof within seven days after receipt of the field order and must not execute the field change pending the execution of a change order unless the change is for accident prevention as cited herein.

(c) The Contractor must furnish to the Owner, when required, an itemized breakdown of the quantities and prices used in computing the value of any change that might be ordered. In figuring these changes, instructions for measurement of quantities set forth in the Specifications must be followed.

(d) Charges or credits for the work covered by the approved change shall be determined by the Owner using one or more or a combination of the following methods:

- i. Unit bid prices stipulated in the Bid or as subsequently approved, which unit prices shall include allowances for overhead and profit.
- ii. An agreed lump sum.
- iii. The actual cost, by keeping a correct account including all vouchers, for:
 1. Labor, including foremen;
 2. Materials entering permanently into the work;
 3. Ownership or rental cost of power tools and construction equipment actually used;
 4. Power and consumable supplies for operation of power equipment actually used;
 5. Prorate charges for insurance covering public liability, Workmen's Compensation, Old Age and Unemployment, and also Social Security.

To the costs in (c) above shall be added a negotiated fixed fee for overhead and profit, not to exceed fifteen percent (15%) of the above items, except that actual cost only will be allowed for Social Security and Unemployment Insurance. Among the items considered as overhead are costs for insurance other than above, bonds, superintendence, timekeeping, clerical work, watchman, use of small tools, general office expense and miscellaneous. The allowance for combined overhead and profit thus calculated shall be the only such allowance included in the total cost of the work performed by the Contractor or his subcontractor. If the work was performed by sub-contract, the Contractor may add a negotiated fixed fee for overhead and profit not to exceed five percent (5%) of the subcontract cost.

If the Owner determines that the Contractor, pursuant to his obligations under paragraph 6 and 7 of the Instruction to Bidders and Special Provisions, should have discovered the conditions prior to the awarding of the bid for the project, it may require the Contractor to complete the project for the contract price and the condition shall be deemed to be materially different as provided herein.

14. Claims for Extra Cost: No claim for extra work or cost shall be allowed, unless the same was done pursuant to a written order by the Engineer, as aforesaid, and the claim presented with the first estimate after the changed or extra work is done. When work is performed under the terms of

Subsection 13(c) of these General Conditions, the Contractor must furnish satisfactory bills, payrolls and vouchers covering all items of cost and when requested by the Owner, give the Owner access to accounts relating thereto.

15. Materials, Services and Facilities:

(a) It is understood that, except as otherwise specifically stated in the Contract Documents, the Contractor must provide and pay for all materials, labor, tools, equipment, water, lights, power, transportation, superintendence, temporary construction of every nature, and all other services and facilities of every nature whatsoever necessary to execute, complete, and deliver the work within the specified time.

(b) Materials and equipment must be stored in a manner to insure the preservation of their quality and fitness for the work.

(c) Any work necessary to be performed after regular working hours, on Sundays or legal holidays, shall be performed without additional expense to the Owner.

16. Patents:

(a) The contractor shall defend, indemnify, hold and save the Owner and its officers, agents, servants, and employees harmless from liability of any nature or kind, including attorney's fees cost and expense, for or on account of any patented or unpatented inventions, process, article, or appliance manufactured or used in the performance of the Contract, including its use by the Owner, unless otherwise specifically stipulated in the Contract Documents.

(b) If the Contractor uses any design, device or materials covered by letter, patents or copyrights, he must provide for such use by suitable agreement with the Owner of such patented or copyrighted design, device or material. It is mutually agreed and understood that, without exception, the Contract prices shall include all royalties or costs arising from the use of such design, device or materials, in any way involved in the work. The Contractor and/or his sureties shall defend, indemnify and save and hold harmless the Owner of the project from any and all claims for infringement by reason of the use of such patented or copyrighted design, device or material or any trademark or copy-right in the connection with work performed under this Contract, and shall indemnify the Owner for any attorneys' fees, cost, expense or damage which it may be obliged to pay by reason of such infringement at any time during the prosecution of the work or after completion of the work.

17. Inspection and Testing of Material: Unless otherwise specifically provided for in the Specifications, the inspection and testing of material and finished articles to be incorporated in the work at the site shall be made by bureaus, laboratories or agencies arranged for by the Contractor and as approved by the Engineer. The Contractor shall furnish all such extra quantities of materials and items as may be required for testing, and shall deliver same to the laboratory. The cost of furnishing and delivering samples to the laboratory shall be paid for by the Contractor.

Where the Detailed Specifications call for certified copies or mill or shop tests to establish conformance of certain materials with the Specifications, it shall be the responsibility of the Contractor to assure the delivery of such certifications to the Owner.

No materials or finished articles shall be incorporated into the work until such materials and finished articles have passed the required tests. The Contractor must promptly segregate and remove rejected material and finished articles from the work site.

The testing and approval of materials by the laboratory or laboratories approved by the Engineer shall not relieve the Contractor of any of his obligations to fulfill his Contract and guarantee of workmanship and materials as called for in Paragraph 21 entitled "General Warranty for one year After Completion of Contract", herein. The Contractor may, at his option and at his expense, cause such other tests to be conducted as he may deem necessary to assure suitability, strength and durability of any material or finished articles.

18. Right of the Owner to Terminate Contract: In the event that any of the provisions of this Contract are violated by the Contractor or by any of his subcontractors, the Owner may serve written notice upon the Contractor and his Surety of his intention to terminate the Contract, such notices to contain the reasons of such intention to terminate the Contract; and unless within ten (10) days after the serving of such notice upon the Contractor, such violation or delay shall cease and satisfactory arrangement of correction be made, the Contract shall, upon the expiration of said ten (10) days, terminate.

In the event of any such termination, the Owner shall immediately serve notice thereof upon the Surety and the Contractor, and the Surety shall have the right to take over and perform the Contract; provided, however, that if the Surety does not commence performance thereof within five (5) days from the date of the mailing to such Surety of notice of termination, the Owner may take over the work, prosecute the same to completion by contract or by force account at the expense of the Contractor, and the Contractor and his Surety shall be liable to the Owner for any excess cost occasioned the Owner thereby, and in such event, the Owner may take possession of and utilize in completing the work, such materials, appliances, and plant as may be on the work site and necessary therefore.

19. Notices and Service Thereof:

(a) Any notice to the Contractor from the Owner, relative to any part of this Contract, shall be in writing and considered delivered and the service thereof completed, when said notice is posted by certified mail, to the said Contractor at his last given address, or delivered in person to said Contractor or his authorized representative on the work, or is deposited in the regular United States mail in a sealed, postage prepaid envelope, and the receipt thereof is acknowledged by the Contractor.

(b) Unless otherwise specified in writing to the Contractor, all papers required to be delivered to the Owner shall be delivered to the County Engineer. Any notice to or demand upon the Owner shall be considered sufficiently given if it is delivered to the office of said County Engineer or deposited in the United States mail in a sealed postage prepaid envelope properly addressed to the County Engineer, or to such other address as the Owner may subsequently specify in writing to the Contractor for such purposes, and it is received by the County Engineer.

20. Quantities of Estimate: The estimated quantities of work to be done and materials to be furnished under this Contract shown in any of the documents, including the Bid, are given for use in comparing bids, and to indicate approximately the total amount of the contract. Except as herein otherwise specifically limited, the right is especially reserved by the Owner to increase or diminish them as may be deemed reasonably necessary or desirable by the Owner to complete the work contemplated by this Contract.

21. General Warranty After Completion of Contract: For a period of at least one year after completion of the Contract and final acceptance of the work by the Owner, the contractor warrants the fitness and soundness of all work done and materials and equipment put in place under the Contract. Neither the final certificate of payment nor any provision in the Contract Documents, nor partial or entire occupancy of the premises by the Owner, shall constitute an acceptance of work not done in accordance with the Contract Documents, or relieve the Contractor of liability for this warranty or for any other warranties or responsibility for faulty materials, equipment or workmanship. The Contractor must remedy any defects in the work and pay for damage resulting there from discovered with a period of one year from the date of final acceptance of work unless a longer period is specified. The Owner will give notice of observed defects with reasonable promptness. This provision in no way affects the Contractor's responsibility to the Owner for latent defects.

22. Contractor's Obligations: The Contractor shall and will, in good workmanlike manner, do and perform all work and furnish all supplies and materials, machinery, equipment, facilities and means, except as herein otherwise expressly specified, necessary or proper and complete all work required by the Contract within the time herein specified, in accordance with the provisions of this Contract and said Specifications, the Plans and Drawings of the work covered by this Contract, and any and all supplemental plans and drawings of the work, and in accordance with the directions of the Engineer as given from time to time during the progress of the work. The Contractor shall furnish, erect, maintain and remove such construction plant and such temporary works as may be required. He alone shall be responsible for the safety, efficiency and adequacy of his plan, appliance and methods, and for any damage which may result from their failure or their improper construction, maintenance or operation.

The Contractor shall observe, comply with, and be subject to all terms, conditions, requirements, and limitations of the Contract Specifications, and shall do, carry on, and complete the entire work to the satisfaction of the Engineer and the Owner.

23. Engineer's Authority: The Engineer shall give all orders and directions contemplated under this Contract and Specifications relative to the execution of the work. The Engineer shall determine the amount, quality, acceptability and fitness of several kinds of work and materials which are to be paid for under the Contract and shall decide all questions which may arise in relation to said work and the construction thereof. The Engineer's estimates and decisions shall be final and conclusive, except as herein otherwise expressly provided. In case any question shall arise between the parties hereto relative to said Contract or Specifications, the determination or decision of the Engineer shall be a condition precedent to the right of the Contractor to receive any money or payment for work under this Contract affected in any manner or to any extent by such question.

The Engineer shall decide the meaning and intent of any portion of the Specifications and or any Plans or Drawings where the same may be found obscure or be in dispute.

Any difference or conflicts, in regard to their work, which may arise between the Contractor and other contractors performing work for the Owner, shall be adjusted and determined by the Engineer.

The Engineer and Owner will not be responsible for the construction means, controls, techniques, sequences, procedures, or construction safety.

24. Owner's Prerogative: The Owner shall have the right to enter the site for the purpose of doing work and/or having work done which is not covered by the Contract Documents. This provision shall not relieve the Contractor of his obligations cited in Item 22 herein, excepting work done by the agents or employees of the Owner. Prior to completion and acceptance of the work set forth in the Contract, the Owner with the concurrence of Engineer and Contractor, may use any completed or substantially completed portion of the work, by such use shall not constitute an acceptance of that portion.

25. "Or Equal" Clause: With the exception of major items of mechanical and electrical equipment, whenever a material or article required is specified or shown on the Drawings by using the name of the proprietary product or of a particular manufacturer or vendor, any material or article which will meet the design criteria and is equal in function and durability, as determined by the Engineer prior to the bid, will be considered acceptable.

26. Prohibited Interests: No official of the Owner who is authorized in such capacity and on behalf of the Owner to negotiate, make, accept, or approve, or to take part in negotiating, making, accepting, or approving any architectural, engineering, inspection, construction or material supply contract, or any subcontract in connection with the construction of the project, shall become directly or indirectly interested personally in this Contract or in any part thereof. No officer, employee, architect, attorney, engineer, or inspector of or for the Owner who is authorized in such capacity and on behalf of the Owner to exercise any legislative, executive, supervisory or other similar function in connection with the construction of the project, shall become directly or indirectly interested personally in this Contract, insurance contract, or any other contract pertaining to the project.

27. Reports, Records and Data: The Contractor and each of his subcontractors must submit to the Owner such schedules, payroll, reports, estimates, records and other data as the Owner may request, or as may be required herein, concerning the work performed or to be performed under this Contract.

28. Acceptance of Work and Final Payment: Before final acceptance of the work and payment to the Contractor of the percentage retained by the Owner, the following requirements must be complied with:

(a) Final Inspection: Upon written notice from the Contractor that his work is completed, the Engineer will make a final inspection of the work, and must notify the Contractor of all instances where his work fails to comply with the Contract Drawings and/or Specifications, as well as any defects he may discover. The Contractor must immediately make such alterations necessary to make the work comply with the Contract Drawings and Specifications to the satisfaction of the Engineer.

(b) **Cleaning Up:** Before the work is considered as complete, all rubbish and unused material due to or connected with the construction must be removed and the premises left in a condition satisfactory to the Owner. Streets, curbs, cross-walks, fences, and other public and private property or rights-of-way disturbed or damaged must be restored to their former condition. Final acceptance will be withheld until such work is finished.

(c) **Liens:** Final acceptance of the work will not be granted, and the retained percentage will not be due or payable until the Contractor has furnished the Owner proper and satisfactory evidence under oath that all claims for labor and material employed or used in the construction of the work under this contract have been settled, and that no legal claims will be filed against the Owner for such labor or materials.

(d) **Final Estimate:** Upon completion of all cleaning up, alterations and repairs required by the final inspection or operation test, the satisfactory completion of the operating test, and upon submitting proper and satisfactory evidence to the Owner that all claims have been settled, the Engineer will issue a certificate of final acceptance of the work. The Contractor shall then prepare his final estimate. After review of the final estimate by the Engineer, and approval by the Owner, the final payment shall then become due.

29. **Minimizing Silting and Bank Erosion During Construction:** During construction protective measures must be taken and maintained to minimize bank erosion, and the silting of creeks and rivers adjacent to work being performed during construction. This must be done as according to the Erosion Control Section of the Specifications and the Stormwater Pollution Plan.

30. **Restoration of Disturbed Areas:** All areas disturbed by or during construction must be restored to their existing or better condition. This provision is not to be interpreted to require replacement of trees and undergrowth in undeveloped sections of rights-of-way.

31. **Chemicals Used During Construction:** All chemicals used during project construction or furnished for project operation, whether herbicide, pesticide, disinfectant, polymer, reactor or of other classification, must show approval of either EPA or USDA. Use of all such chemicals and disposal or residue must be in strict conformity with manufacturer's instructions.

32. **Acceptance of Final Estimate:** The acceptance by the Contractor of the final payment shall operate as a release to the Owner from all claims and liabilities to the Contractor for all work done or materials furnished, or for any act of the Owner or its agents affecting the work.

33. **Inspection by Agencies:** The representatives of all local, state and federal regulatory agencies legally authorized to have access shall have access to the work wherever it is, in preparation or progress, and the Contractor must provide proper facilities for such access and inspection.

34. **Litigation:** In the event of litigation in which the Owner is or becomes a party, the Contractor agrees and consents that the litigation shall be filed in or transferred to the Court of Common Pleas of Aiken County, South Carolina or the Aiken Division of the United States District Court for the District of South Carolina and that the laws of the State of South Carolina shall apply to and govern such litigation. The Contractor further agrees to cooperate with the Owner in obtaining the transfer of such litigation to those courts by promptly signing all documents necessary thereto.

35. Unauthorized Aliens and Public Employment:

(a) By signing its bid, offer, or proposal, Contractor certifies that it will comply with the applicable requirements of Title 8, Chapter 14 of South Carolina Code of Laws and agrees to provide to the Owner upon request any documentation required to establish either:

- i.** That Title 8, Chapter 14 is inapplicable both to Contractor and its subcontractors or sub-subcontractors; or
- ii.** That Contractor and its subcontractors or sub-subcontractors are in compliance with Title 8, Chapter 14.

(b) Pursuant to Section 8-14-60, "A person who knowingly makes or files any false, fictitious, or fraudulent document, statement, or report pursuant to this chapter is guilty of a felony, and, upon conviction, must be fined within the discretion of the court or imprisoned for not more than five years, or both."

(c) Contractor agrees to include in any contract with its subcontractors language requiring its subcontractors

- i.** To comply with the applicable requirements of Title 8, Chapter 14, and
- iii.** To include in their contracts with their sub-subcontractors language requiring their sub-subcontractors to comply with the applicable requirements of Title 8, Chapter 14.

END GENERAL CONDITIONS

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BID FORM – LANGLEY POND PARK, PHASE 1

TO THE COUNTY AND COUNTY COUNCIL
OF AIKEN COUNTY, SOUTH CAROLINA

Submitted _____, 2020

The undersigned, as Bidder, hereby declares:

1. That the only person or persons interested in the bid as principal or principals is (or are) named herein and that no person other than mentioned herein has any interest in this Bid or in the Contract to be entered into;
2. That this bid is made without connection with any other person, company or parties making a bid; and
3. That in all respects, this bid is made fairly and in good faith, without collusion or fraud.
4. A schedule of values in accordance with section 00 43 73 is attached to this bid form
5. A list of subcontractors in accordance with section 00 43 36 is attached to this bid form.

The Bidder further declares:

6. That he has examined the site of the work and has informed himself fully in regard to all conditions pertaining to the place where the work is to be done; and
7. That he has examined the Drawings and Specifications for the work and contractual documents relative thereto and has read all Special Provisions and General Conditions furnished prior to the opening of bids; and
8. That he has satisfied himself relative to all work to be performed.

The Bidder proposes and agrees, if this Bid is accepted, to:

- A. Contract with Aiken County, South Carolina, a body politic and corporate and a political subdivision of the state of South Carolina (hereinafter called The Owner), in the form of contract specified,
- B. To furnish all necessary materials, equipment, machinery, tools, apparatus, means of transportation and labor necessary and to complete the construction of the work in full and complete accordance with the shown, noted, described, and reasonably intended requirements of the Drawings, Specifications and Contract Documents to the full and entire satisfaction of The Owner, with a definite understanding that no money will be allowed for extra work except as set forth in the attached General Conditions and Contract Documents, for the following prices:

BID FORM – LANGLEY POND PARK, PHASE 1

The **Total Amount of Bid**, including applicable sales taxes is:

Dollars and Cents

(\$ _____) Dollars and Cents

ALTERNATES & ADDITIONS

ADD ALTERNATES:			
#	ITEM	UNIT RATE	TOTAL ADD
AA1	REPLACE ASPHALT PAVING SHOWN ON PLAN AT BOAT RAMP WITH HEAVY DUTY CONCRETE PAVING PER DETAIL (REFER TO SHEETS C1.1 & C4.3	LUMP	
DEDUCTIVE ALTERNATES:			
	ITEM	UNIT RATE	TOTAL DEDUCT
DA1	SEGMENTAL WALL RIDGEROCK BEVELED EDGE SYSTEM IN BUFF COLOR IN LIEU OF THE KEYSTONE HARINGTON 3 PIECE SYSTEM.	LUMP	
DA2	GRILL PLAZA - COMPLETE (INCLUDING DENCING)	LUMP	
DA3	MISTING STATION PLAZA - COMPLETE INCLDUING BENCHES	LUMP	
DA4	HAMMOCK PARK "A" - COMPLETE	LUMP	
DA5	HAMMOCK PARK "B" - COMPLETE	LUMP	
DA6	SHADE SAIL 1 - COMPLETE	LUMP	
DA7	CONCESSIONS PLAZA - COMPLETE - NO CONCRETE PLAZA, NO BEACH IMPROVEMENTS, NO TILE WORK (EXCLUDES DRINKING FOUNTAIN & STORM DRAINAGE)	LUMP	
DA7	CONCESSIONS PLAZA - PLAIN CONCRETE PLAZA ONLY, NO BRICK ACCENTS, NO BEACH IMPROVEMENTS, NO TILEWORK (EXCLUDES DRINKING FOUNTAIN & STORM DRAINAGE)	LUMP	
DA8	COMMUNICATIONS CONDUIT - 1 TO MAINTENANCE SHED	LUMP	
DA9	COMMUNICATIONS CONDUIT - 1 TO CONCESSIONS ONLY	LUMP	
ADDITIONAL UNIT RATE ITEMS PER ENGINEER			
	ITEM	UNIT RATE	COST PER UNIT RATE
AU1	EXCAVATION AND DISPOSAL OF UNSUITABLE SOILS	CY	
AU2	IMPORT AND PLACEMENT OF SELECT BACKFILL	CY	
AU3	#57 STONE	TON	
AU3	#4 STONE	TON	

BID FORM – LANGLEY POND PARK, PHASE 1

ADDENDA

Bidder must acknowledge by signature having seen each and all Addenda issued for this project (if applicable):

Addendum Number ____ : _____ **(L.S)**

Addendum Number ____ : _____ **(L.S)**

Addendum Number ____ : _____ **(L.S)**

(Include Additional Signature Sheet for Addenda if Needed)

SCHEDULE OF VALUES

Attach - 004373 Schedule of Values Form

SCHEDULE

The Bidder further proposes and agrees hereby to commence work under this contract, with adequate force and equipment, on a date to be specified in a written order of the Engineer, and shall fully complete all work there under within the following number of consecutive calendar days from and including that date:

(270) Consecutive Calendar Days

The Bidder declares that he understands that the unit price quantities shown in the Bid are subject to adjustment by either increase or decrease, and that should the quantities of any of the items of the work be increased, the undersigned proposes to do the additional work at the unit prices stated herein; and should the quantities be decreased, he also understands that payment will be made on actual quantities used at the unit price bid and will make no claim for anticipated profits for any decrease in the quantities and that quantities will be determined upon completion of the work at which time adjustment will be made to the contract amount by direct increase or decrease.

Submitted: _____

By: _____ **(L.S)**

Title: _____

General Contractor's License No. _____

(Note: If the Bidder is a Corporation, the Bid shall be signed by a duly authorized Officer of the Corporation; if a Partnership, it shall be signed by a Partner. If Signed by other, authority for signature shall be attached. The name of the person Signing must be typed in under his/her signature.)

STATE OF SOUTH CAROLINA)
)
COUNTY OF AIKEN) CONSTRUCTION AGREEMENT

THIS AGREEMENT is made and entered into on the _____ day of _____ 2018, by and between AIKEN COUNTY, SOUTH CAROLINA, a body politic and corporate and a political subdivision of the State of South Carolina, (hereinafter called the “OWNER”) and (Insert FULL LEGAL NAME of Contractor), a (if incorporated, insert STATE where incorporated) corporation (hereinafter called the “CONTRACTOR”).

WITNESSETH:

That the CONTRACTOR, for the consideration hereinafter fully set out, hereby agrees with the OWNER as follows:

1. That the CONTRACTOR will furnish all equipment, tools, materials, skill, and labor of every description necessary to carry out and to complete in a good, firm, substantial, and workmanlike manner, the Work specified, in strict conformity with the Documents entitled:

LANGLEY POND PARK, PHASE 1

on file in the office of the OWNER, and the Specifications hereinafter set forth, which Drawings and Specifications, together with the foregoing Bid, Advertisement for Bids, Instructions to Bidder, Special Provisions, General Conditions, and all addenda hereto annexed, shall form essential parts of this CONSTRUCTION AGREEMENT, as if fully contained herein. The Work covered by this CONSTRUCTION AGREEMENT includes all Work as Specified and listed in the attached Bid, under the following items, to wit:

LANGLEY POND PARK, PHASE 1

2. That the CONTRACTOR shall commence Work to be performed under this CONSTRUCTION AGREEMENT on a date to be specified in a written order of the OWNER’s ENGINEER and shall fully complete all Work hereunder by **(270) consecutive, calendar days** except as otherwise provided in these documents for extensions of the above time limit.

Time is of the essence of this CONSTRUCTION AGREEMENT, and the CONTRACTOR shall pay to the OWNER, not as a penalty, but as Liquidated Damages, the sum of **Two Hundred Fifty and 00/100 Dollars (\$250.00)**

for each consecutive, calendar day that the CONTRACTOR shall be in default of completing the Work within the time limit named herein. Because of the difficulty of fixing damages suffered by the OWNER on account of such default, damages are herein agreed upon as stated.

3. The OWNER hereby agrees to pay the CONTRACTOR for the faithful performance of this CONSTRUCTION AGREEMENT, subject to additions and deductions as provided in the Drawings and Specifications, together with the Bid, Advertisements for Bids, Instructions to the Bidders, Special Provisions, General Conditions, and all Addenda hereto annexed, in lawful money of the United States, the sum of:

Dollars

(\$ _____) Dollars and Cents

which sum shall also pay for all loss or damages arising out of the nature of the Work aforesaid, or from the action of the elements, or from unforeseen obstructions or difficulties encountered in the prosecuting of the Work, and for all expenses incurred by or in consequence of the Work, its suspension or discontinuance, and for well and faithfully completing the Work and the whole thereof, as herein provided, and for replacing defective Work, material, or equipment provided for a period of **one (1) year** after completion of all Work.

4. No later than 30 days after pay requests are promptly and properly submitted, as the Work progresses, the OWNER shall make partial payments to the CONTRACTOR on the value of labor and materials incorporated into the Work and of materials on hand at the Site of the Work, except cement and other materials subject to deterioration, during the preceding calendar month, less payments already made and less deductions for any unaccepted or defective Work, in accordance with terms set forth in the Specifications.

5. Upon submission by the CONTRACTOR of evidence satisfactory to the OWNER that all payrolls, material bills, and other costs of any kind incurred by the CONTRACTOR in connection with the construction of the Work have been paid in full, final payment on account of this CONSTRUCTION AGREEMENT shall be made within thirty (30) days after the completion by the CONTRACTOR of all Work covered by this CONSTRUCTION AGREEMENT and the acceptance of such Work by the OWNER.

REMAINDER OF PAGE INTENTIONALLY LEFT BLANK

IN WITNESS WHEREOF, the parties hereto have caused this CONSTRUCTION AGREEMENT to be executed by their duly authorized officers as of the date first above written in four (4) counterparts, each of which shall, without proof or accounting for the other counterparts, be deemed an original agreement. It is the intention of the parties that this Construction Agreement is a sealed instrument regardless of whether or not any seal is actually attached hereto.

Signed, Sealed, and Delivered in the Presence of: **AIKEN COUNTY, SOUTH CAROLINA**

Witnesses:

By: _____

Gary Bunker
County Council Chairman

ATTEST:

_____ (SEAL)
COUNTY CLERK (Official Seal)

CONTRACTOR

Signed, Sealed and Delivered in the Presence of:

(Print or Type Name of CONTRACTOR)

Witnesses:

(As to the CONTRACTOR)

By: _____

(Print or Type Name)

(Print or Type Name)

Its: _____

(As to the CONTRACTOR)

(Print or Type Name)

ATTEST:

* _____ (SEAL)

(Print or Type Name)

Its: _____

(Official Seal)

APPROVED AS TO FORM AND CONTENT

Attorney for the OWNER

*** NOTE: SIGNING INSTRUCTIONS - THESE INSTRUCTIONS MUST BE FOLLOWED.**
If CONTRACTOR is a Corporation, the CONSTRUCTION AGREEMENT must be signed by the President or Vice-President, Attested by the Secretary, and the Corporate Seal affixed.
If CONTRACTOR is a Partnership, the CONSTRUCTION AGREEMENT must be signed in the Partnership's Name by one of the Partners, with indication that (s)he is a General Partner. Signatures must be legible with the printed or typed name under each appropriate signature.

PERFORMANCE BOND

STATE OF SOUTH CAROLINA)
)
COUNTY OF AIKEN)

KNOW ALL MEN BY THESE PRESENTS, that we _____
(hereinafter called the CONTRACTOR), of _____

as principal, and Aiken County Government a corporation duly qualified and authorized under the laws of the State of South Carolina to act as surety bonds (hereinafter called the SURETY), do hereby acknowledge ourselves indebted and firmly bound and held unto Aiken County, South Carolina, a body politic, and Corporate, and a Political Subdivision of the State of South Carolina (hereinafter called the OWNER) for the use and benefit of those entitled hereto, in the sum of:

Dollars and 00/100 Dollars

(\$) Dollars and Cents

for the payment of which well and truly to be made in lawful money of the United States, we do hereby bind ourselves, successors, assigns, heirs, and personal representatives.

BUT THE CONDITIONS OF THE FOREGOING OBLIGATION OR BOND ARE THIS:

WHEREAS, the CONTRACTOR has entered into a written Agreement or Contract with the OWNER, a copy of said contract being attached hereto and is by reference made a part hereof, the same as if set forth fully herein for constructing:

LANGLEY POND PARK, PHASE 1

and it is the desire of the OWNER that the said CONTRACTOR shall assure all undertakings under said Agreement or Contract.

NOW THEREFORE, if the said CONTRACTOR shall fully and faithfully perform all the undertakings and obligations under the said Agreement or Contract hereinbefore referred to and shall fully indemnify and save harmless the said OWNER from all costs and damages whatsoever which it may suffer by reason of any failure on the part of said CONTRACTOR so to do, and shall fully reimburse and repay the said OWNER any and all outlays and expense which it may incur in making good any such default, and shall guarantee all materials and workmanship against defects for a period of one (1) year after the final settlement of the said Agreement or Contract, then this obligation or Bond shall be null and void, otherwise, to remain in full force and effect.

For value received, it is hereby stipulated and agreed that no changes, alteration, extension of time, or addition to the terms of the said Agreement or Contract or in the Work to be performed thereunder or the Specifications accompanying the same, shall in any wise affect the obligation under said obligation or Bond, and notice is hereby waived of any such changes, extension of time, alteration or addition to the terms of the Agreement or Contract, or to the Work or the Specifications.

IN WITNESS WHEREOF, the said CONTRACTOR has hereunder affixed his signature and said SURETY has hereunto caused to be affixed its corporate signature, and seal, by its attorney-in-fact, on this the _____ day of _____, 2018, executed in four (4) counterparts, each of which shall, without proof or accounting for the other counterparts, be deemed an original.

Signed, Sealed, and Delivered in the Presence of:

(CONTRACTOR)

1. _____
(As to CONTRACTOR)

By: _____ L.S.

(Print or Type Name)

(Print or Type Name)

2. _____
(As to CONTRACTOR)

Title: _____ L.S.

(Print or Type Name)

ATTEST:
By: _____

(Print or Type Name)

1. _____
(As to SURETY)

ATTEST:
By: _____

_____ L.S.

(Print or Type Name)

(Print or Type Name)

Its: _____
(OFFICIAL SEAL)

2. _____
(As to SURETY)

(SURETY)
By: _____ L.S.

(Print or Type Name)

(Print or Type Name)

TITLE: _____

APPROVED AS TO FORM BEFORE EXECUTION:

(Attorney for the OWNER)

*** NOTE: If the Principal is a Corporation, the Bond shall be signed by the President or a Vice-President, attested by the Secretary and the Corporate Seal Affixed. If the Principal is a partnership, the Bond shall be signed in the Partnership Name by one of the Partners, with the indication that he is a General Partner. Signatures must be legible and typed in under the appropriate line. THESE INSTRUCTIONS MUST BE FOLLOWED.**

PAYMENT BOND

STATE OF SOUTH CAROLINA)
)
COUNTY OF AIKEN)

KNOW ALL MEN BY THESE PRESENTS, that we _____
(hereinafter called the CONTRACTOR), of _____

as principal, and _____ a corporation duly qualified and authorized under the laws of the State of South Carolina to act as surety bonds (hereinafter called the SURETY), do hereby acknowledge ourselves indebted and firmly bound and held unto Aiken County, South Carolina, a body politic, and Corporate, and a Political Subdivision of the State of South Carolina (hereinafter called the OWNER) for the use and benefit of those entitled hereto, in the sum of:

(_____) Dollars and Cents

for the payment of which well and truly to be made in lawful money of the United States, we do hereby bind ourselves, successors, assigns, heirs, and personal representatives.

BUT THE CONDITIONS OF THE FOREGOING OBLIGATION OR BOND ARE THIS:

WHEREAS, the CONTRACTOR has entered into a written Agreement or Contract with the OWNER, a copy of said contract being attached hereto and is by reference made a part hereof, the same as if set forth fully herein for the furnishing of all labor, materials, equipment, tools, and supplies for constructing:

LANGLEY POND PARK, PHASE 1

and it is the desire of the OWNER that the said CONTRACTOR shall assure and protect all laborers and furnishers of materials on said Work.

NOW THEREFORE, if the said CONTRACTOR and all Subcontractors to whom any portion of the Work provided for in the attached Agreement or such Subcontractors shall promptly make payment to all persons supplying him or them with labor, materials, equipment, tools, and supplies for or in the prosecution of the Work provided for in such Agreement or Contract, or in any amendment, extension, or addition thereto, and for payment of reasonable attorney's fees incurred by any clamant or claimants in suits on this bond, then the above obligation or bond shall be null and void, otherwise, to remain in full force and effect.

PROVIDED, however, that this bond is subject to the following conditions and limitations:

(a) Any persons, firm or corporation that has furnished labor, materials, equipment, tools, or supplies for, and in the prosecution of the Work provided for in said Agreement or Contract, shall have a direct right of action against the CONTRACTOR and SURETY on this bond, which right of action shall be asserted in a proceeding, instituted in the County in which the Work provided for in said Agreement or Contract is to be performed or in any County in which said CONTRACTOR or SURETY does business. Such right of action shall be asserted in a proceeding instituted in the name of the claimant or claimants for his or their use and benefit against said CONTRACTOR or SURETY or either of them (but no later than one year after the final settlement of said Agreement or Contract) in which action such claim or claims shall be adjudicated and judgment rendered thereon.

(b) The CONTRACTOR and SURETY hereby designate and appoint the County Administrator of Aiken, South Carolina, as the agent for each of them to receive and accept service of process or other pleading issue or filed in any proceeding instituted on this bond and hereby consent that such service shall be the same as personal service on the CONTRACTOR and/or SURETY.

(c) In no event shall the Surety be liable for a greater sum than the penalty of this bond, or subject to any suits, action, or proceeding thereon that is instituted later than one year after the final settlement of the said Agreement or Contract.

IN WITNESS WHEREOF, the said CONTRACTOR has hereunder affixed his signature and said SURETY has hereunto caused to be affixed its corporate signature, and seal, by its attorney-in-fact, on this the _____ day of _____, 2018, executed in four (4) counterparts, each of which shall, without proof or accounting for the other counterparts, be deemed an original.

Signed, Sealed, and Delivered in the Presence of:

(CONTRACTOR)

1. _____
(As to CONTRACTOR)

By: _____ L.S.

(Print or Type Name)

(Print or Type Name)

Title: _____ L.S.

2. _____
(As to CONTRACTOR)

ATTEST:

By: _____

(Print or Type Name)

(Print or Type Name)

1. _____
(As to SURETY)

ATTEST:

By: _____

(Print or Type Name)

(Print or Type Name)

Its: _____
(OFFICIAL SEAL)

2. _____
(As to SURETY)

(Print or Type Name)

(SURETY)

By: _____ L.S.

(Print or Type Name)

TITLE: _____

APPROVED AS TO FORM BEFORE EXECUTION

(Attorney for the OWNER)

*** NOTE: If the Principal is a Corporation, the Bond shall be signed by the President or a Vice-President, attested by the Secretary and the Corporate Seal Affixed. If the Principal is a partnership, the Bond shall be signed in the Partnership Name by one of the Partners, with the indication that he is a General Partner. Signatures must be legible and typed in under the appropriate line. THESE INSTRUCTIONS MUST BE FOLLOWED.**

PRECONSTRUCTION CONFERENCE

(Rev. July 2013)

1.1 DESCRIPTION

To help clarify construction contract administration procedures, the County (Owner) will conduct a Preconstruction Conference prior to start of the work. Contractor(s) will designate personnel for attendance.

1.2 SUBMITTALS

- A. To the maximum extent practicable, advise the County Engineer at least 4 hours in advance of the Conference as to items to be added to the agenda.
- B. The Engineer will compile minutes of the Conference, and will furnish copies of the minutes to the Contractor. The Contractor may make and distribute such other copies as he wishes.

1.3 PRECONSTRUCTION CONFERENCE

- A. The Conference will be held after the Owner has issued the "Notice of Award", but prior to actual start of the work.
- B. Attendance:
 - 1. Provide attendance by authorized representatives of the Contractor and major subcontractors. For those persons designated by the Contractor, his subcontractors, and suppliers to attend the Preconstruction Conference, provide required authority to commit the entities they represent to solutions agreed upon in the Conference.
 - 2. The Engineer will advise other interested parties, including but not limited to, utilities and SCDOT, and request their attendance.
- C. Minimum agenda: Data will be distributed and discussed on:
 - 1. Organizational arrangement of Contractor's forces and personnel, and those of subcontractors, materials suppliers and the Engineer;
 - 2. Establish channels and procedures for communication;
 - 3. Construction schedule, including sequence of critical work;
 - 4. Contract documents, including distribution of required copies of drawings and revisions;
 - 5. Processing of Shop Drawings and other data submitted to the Engineer for review;
 - 6. Processing of field decisions and Change Orders;
 - 7. Rules and regulations governing performance of the Work; and
 - 8. Procedures for safety, security, quality control, traffic control, etc.

Also during the Conference, the project start date will be determined. After the end of the Conference, a "Notice to Proceed" will be issued to the Contractor.

END OF SECTION – REMAINDER OF PAGE LEFT BLANK



Report of Geotechnical Exploration
Langley Pond Park Improvements
Langley Pond Dam Road,
Burnettown, South Carolina
S&ME Project No. 3319-20-027

PREPARED FOR:

Alfred Benesch & Company
1005 Broad Street
Suite 200
Augusta, Georgia 30901

PREPARED BY:

S&ME, Inc.
1527 Crescent Drive
Augusta, GA 30909

August 6, 2020



August 6, 2020

Alfred Benesch & Company
1005 Broad Street
Suite 200
Augusta, Georgia 30901

Attention: Mr. Charles Hall, AICIP, LEED AP BD+C

Reference: **Report of Geotechnical Exploration
Langley Pond Park Improvements**
Langley Pond Dam Road, Burnetttown, South Carolina
S&ME Project No. 3319-20-027

Dear Mr. Hall:

S&ME, Inc. (S&ME) has completed a geotechnical exploration for the proposed improvements to Langley Pond Park located at 113 Langley Pond Dam Road in Burnetttown, South Carolina. Our services were performed pursuant to S&ME Proposal No. 33-1900311, dated December 5, 2019 and authorized on June 9, 2020. The purposes of our services were to explore the site subsurface conditions in the addition area, evaluate those conditions, and provide recommendations for site preparation, earthwork, and recommendations for axial load resistance for pile foundations associated with a new covered boat dock. This report presents our understanding of the project, the site and subsurface conditions encountered, and our conclusions and recommendations.

We appreciate the opportunity to serve as the geotechnical consultant during this phase of the project. Please contact us if you have questions about this report or if we may be of further service.

Sincerely,

S&ME, Inc.

Robert A. Williamson, P.E.
Senior Engineer
SC. Reg. No. 26424



Timothy J. Mirocha, P.E. (GA)
Principal Engineer





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1.0 Project Description

Initial information regarding the project and site was provided during email correspondence from Mr. Charlie Hall with Alfred Benesch & Company to Mr. Robert Williamson, P.E. of S&ME on November 25, 2019. Provided in the email correspondence was an unnamed drawing (dated 11-25-19) by Alfred Benesch & Company indicating a new park layout with requested boring locations. The approximate site location is depicted on the Site Vicinity Map (Figure No. 1).

Review of the referenced drawing indicates the proposed improvements will include a new parking lot for overflow parking to be located north of the existing dirt road, new paved parking lot and drive lanes to be located north and west of the existing pavilion, and a new covered dock structure to be located west of the existing beach. Additional park improvements will also include new walking paths located adjacent to Langley Pond, a new playground area, and an expansion to the existing beach.

The site was used as a staging area during the construction of a new replacement dam along the western portion of Langley Pond. Based on our December 3, 2019 site visit and review of available topography, the improvement site area slopes downward from northwest to southeast, with approximately 41 feet of relief. Currently, portions of the site contain soil stockpiles and some of the perimeter along the northwestern and eastern sections of the site are moderately wooded.

Structural design details and loading associated with the covered dock and traffic loading conditions were not available at the time of this report. We have assumed that the covered dock will be a wooden structure supported by driven timber piles. If any of the assumptions stated above are not correct, please contact us so that we can determine if our conclusions and recommendations need to be modified.

2.0 Methods of Exploration

Prior to mobilization to the site, we contacted South Carolina 811, (SC811, a.k.a. Utility Protection Center) and notified them of our planned exploration so that their member utilities could be marked. The boring locations were established in the field by referencing existing site features and by using hand-held GPS equipment. The locations of the borings are shown on the Test Location Sketch (Figure No. 2) in the Appendix and should be considered approximate. Based on the June 8, 2020 email from you to Mr. Robert Williamson, P.E. with S&ME, three additional boring locations were added to further delineate potential fill.

3.0 Exploratory and Testing Procedures

3.1 Private Utility Locate

On June 22, 2020, Underground Utility Pro, under subcontract to S&ME, used a combination of ground penetrating radar (GPR) and radio-frequency electromagnetic (EM) pipe and cable locators in an attempt to locate

**Report of Geotechnical Exploration
Langley Pond Park Improvements**

Langley Pond Dam Road, Burnetown, South Carolina
S&ME Project No. 3319-20-027



potential existing buried utilities or embedded structures prior to drilling activities. Identified subsurface utilities were marked on the existing ground surface with colored spray paint.

3.2 Subsurface Exploration

On June 26, 2020, S&ME mobilized an ATV-mounted CME 45 drill rig equipped with an automatic hammer to drill a total of four soil test borings for the proposed roadway and pavement improvements, three soil test borings for fill characterization, and one soil test boring for the proposed boat dock. The soil test borings were advanced using hollow stem auger drilling techniques in general accordance with ASTM D6151, the *Standard Practice for Using Hollow-Stem Augers for Geotechnical Exploration and Soil Sampling*. Split-spoon sampling and Standard Penetration Testing (N values) were performed in general accordance with ASTM D1586, the *Standard Test Method for Standard Penetration Test (SPT) and Split-Barrel Sampling of Soils* at 2½-ft intervals within the upper 10 feet and at 5-foot intervals thereafter. An automatic hammer was used during the standard penetration testing. Automatic hammers are typically more efficient than manual hammers and can thus yield lower standard penetration resistances. We have accounted for this improved efficiency in our analysis, but the consistency descriptions shown on the boring logs are based on the field resistance data. The test boring locations are shown on the Test Location Sketch (Figure No. 2) attached in the Appendix. Ground surface elevations at each boring location were estimated to the nearest one foot based on elevations indicated on Google Earth. Both the locations and the elevations should be considered approximate.

A member of our engineering staff was present during the exploration to direct the sampling and to log the subsurface conditions encountered in the borings. The retained samples were classified in the field in general accordance with ASTM D2488, *Standard Practice for Description and Identification of Soils (Visual-Manual Procedure)*. The field classifications were adjusted as necessary after laboratory index testing provided additional data.

After they were checked for groundwater, the boreholes were backfilled with the cuttings and borehole-closure devices were installed near the surface to reduce backfill settlement.

3.3 Laboratory Testing

Split-spoon samples collected during the field exploration were returned to the laboratory where they were visually examined, classified, and logged by a member of our staff in general accordance with ASTM D2488, the *Standard Practice for Description and Identification of Soils (Visual-Manual Procedure)*. The purposes of this review were to check the field descriptions, visually estimate the relative percentages of the soils' constituents (sand, clay, etc.), determine soil origin, and identify pertinent structural features. The stratification lines shown on the appended Boring Logs represent the approximate boundaries between soil types, but the transitions may be more gradual than shown. The interpreted soil test boring logs are included in the Appendix.

Laboratory testing was performed on select split-spoon samples to assist in our classification and analysis. The testing included the procedures and numbers of tests shown in Table 1 below. The laboratory test data sheets are presented in the Appendix.



Table 3.1 – Laboratory Testing Summary

Test Type	Specification	Quantity
Natural Moisture Content	ASTM D 2216	8
Grain Size Analysis	ASTM D 422	7
Atterberg Limits	ASTM D 4318	1
Standard Proctor	ASTM D 698	1
Organic Matter	ASTM D 2974	1
California Bearing Ratio	ASTM D 1883	1

4.0 Site and Subsurface Conditions

The site is located within the existing Langley Pond Park at 113 Langley Pond Dam Road in Burnetttown, South Carolina. The area currently consists of compacted soil drive lanes and parking areas, open air pavilions, and beach areas. The planned improvements include installation of paved drive lanes and parking areas, new overflow parking areas, and a covered dock. Existing grades slope downward from the northwest to the southeast with up to 41 feet of relief across the site.

4.1 Geologic Conditions

This area is located very near the fall line between the Coastal Plain and Piedmont Physiographic Provinces of Georgia. The project site is situated in the Black Creek/Blufftown formation of the Eocene Series of the lower undifferentiated Cretaceous Coastal Plain sediments and is situated in the Aiken Plateau Physiographic Region of the Upper Coastal Plain of South Carolina.

The Aiken Plateau lies seaward and stratigraphically above the White Sand Hills to the northwest. It denotes an area underlain by Tertiary and Eocene age sediments of the Dry Branch or Huber formations. In many areas there is an upper deposit of archaic beach terrace soils which form a thin veneer over older, underlying Coastal Plain soils. The veneer consists of medium dense, coarse-grained red-brown clayey sands or stiff reddish sandy silts or clays with numerous rounded quartz pebbles embedded in the soil binder. These are underlain by mostly impervious interbedded red sandy clays or clayey sands, with multiple horizons of gravel or rounded pebbles and occasional thick, very tough iron-oxide cemented sands, claystones, or fullers earth seams, which occur within a very complex stratigraphy. Groundwater (that is not perched) commonly occurs at depths exceeding 25 feet. The ground surface is gently rolling to level, with few deeply incised stream channels and often supports heavy forest cover. Major stream channels eroded through the strata typically create very steep, near vertical side slopes characteristic of cohesive, deeply weathered strata.

The Piedmont extends in a "narrow" (75 to 100 miles wide) band from Alabama to New York. This geologic province can best be described topographically as having eroded into broad rolling hills and valleys. The region is composed of the oldest geologic formations in the southeastern United States. The bedrock of this area is primarily metamorphic gneisses and schists, with some local granite intrusions. The bedrock has weathered in-place to form the overburden soils. Because they have weathered from the parent rock, these soils are termed "residuum". The upper soils are the most highly weathered and are often composed of clays or silts. With depth,

**Report of Geotechnical Exploration
Langley Pond Park Improvements**

Langley Pond Dam Road, Burnetown, South Carolina
S&ME Project No. 3319-20-027



these upper materials transition into less cohesive sandy silts and silty sands with varying mica content. Separating the completely weathered soil overburden from the unaltered parent rock is a transition zone of very high consistency materials locally referred to as *partially weathered rock*. Partially weathered rock retains much of the appearance and fabric of the parent rock formation and may consist of alternating layers of high consistency soil and rock. Partially weathered rock exhibits standard penetration resistances in excess of 100 bpf (e.g. 50/6”).

4.2 Subsurface Conditions

The subsurface conditions summarized below represent the conditions encountered in the field exploration and are generalized in nature. Please refer to the boring logs for conditions at the individual boring locations. Each of the borings extended to their planned depths

4.2.1 Fill Material

A layer of existing fill, classified as silty sand (SM), poorly-graded sand with silt (SP-SM) and poorly graded gravel with sand (GP), was encountered below the surface materials at borings B-1 through B-4 and B-6 through B-8. This layer extended to a depth ranging from roughly 3 feet to 12 feet below the existing ground surface. The fill soils encountered were generally moist and gray to brown in color. Organic debris and deleterious materials were encountered in the fill material at several locations. SPT N-values ranged between 5 to 17 bpf, indicating a relative consistency of loose to medium dense relative density. Laboratory testing of representative samples indicates natural moisture contents ranging between 16.5 percent to 96.7 percent and a fines content ranging between 7.0 percent to 26.6 percent. Organic content testing (by loss on ignition) for a select sample from boring B-4 indicates an organic content of 55.2 percent. Standard Proctor testing of the bulk sample collected from boring B-2 indicates a maximum dry density of 110.2 pcf at an optimum moisture content of 15.5 percent. California Bearing Ratio (CBR) testing remolded to 99 percent of the maximum dry density resulted in a corrected value of 13.7.

4.2.2 Coastal Plain Deposits

Beneath the surface materials and undocumented fill materials, native Coastal Plain deposits were encountered. Coastal Plain soils consisted of sands with varying amounts of non-plastic to low plasticity fines (SP, SP-SM, SM, and SC). Recovered samples were reddish brown, white, and gray. The Coastal Plain soils were typically loose to medium dense in relative density.

4.2.3 Residual Materials

Boring B-5 encountered soils judged to be residual soils of the Piedmont geologic province that underlies the Coastal Plain soils in upland areas. The residual soils were classified as silty sand and exhibited N values of 29 to 57 bpf.

4.2.4 Partially Weathered Rock

An upper layer of partially weathered rock (PWR) was encountered within the residual materials at depths of 48 to 52 feet at boring B-5 and then continuously below 58 feet. PWR encountered in this exploration was typically



visually described as silty sand with varying silt content and exhibited a standard penetration resistance of 50 blows per 3 to 5 inches of penetration of the sampling device.

4.3 Subsurface Water

Subsurface water was encountered in the borings at depths ranging between 3 feet to 11 feet below surface at the time of drilling. Dry hole cave depths ranged between 7 to 11 feet below surface grade indicating possible deeper groundwater conditions. Subsurface water levels at the site will fluctuate during the year due to such things as seasonal and climatic variations or changes in drainage characteristics in the area (such as additional impervious areas or stormwater detention/infiltration basins).

5.0 Conclusions and Site Assessment

The exploration indicates the site is adaptable for the proposed construction. The primary geotechnical considerations will be site preparation, undercutting of existing fill materials, and controlled fill placement and compaction. The boat dock structure can likely be supported on driven timber piles.

Boring samples of the existing undocumented fill contained organics, topsoil, debris, and other deleterious materials. The thickness of the fill will vary in depth across the site and may contain soft zones that may adversely impact long term pavement performance. Thus, we recommend that the existing fill not be relied upon for pavement or structural support (as much as is practical).

5.1 General Recommendations

The following sections present our geotechnical recommendations regarding site grading and structural support. When reviewing these recommendations, it must be kept in mind that, as with any previously developed site, unexpected subsurface conditions may be encountered. These could include such things as poorly compacted fill deposits, buried debris, or remnants of previous construction. These conditions can normally be handled during construction but will require on-site engineering evaluation.

5.2 Site Preparation

Site preparation should begin with the removal of unsuitable surface materials. This should include clearing vegetation, stripping organic-laden topsoil, grubbing roots, and undercutting unsuitable surface soils. Voids created during stripping and grubbing should be cleaned and backfilled with well-compacted structural fill.

Once the construction area has been stripped, the area should be undercut of existing undocumented fill. Care should be taken adjacent to any existing structures. An offset of at least 5 feet from the planned edge of existing pavement should be maintained during removal of the existing fill. From that line, excavation should extend outward and downward at a 1.5 (H) to 1(V) slope until natural soils are encountered. Following removal of the undocumented fill, the exposed subgrade should be evaluated by our representative through observation of proofrolling with a loaded tandem axle truck prior to fill placement. Areas that pump or rut excessively should be densified in place or stabilized as recommended by the Geotechnical Engineer. If the soil boring samples are



representative of the fill mass, we expect that the existing fills can likely be re-used as structural fill, provided any organics, topsoil and debris are removed. Some moisture content adjustment may be needed.

5.3 Structural Fill

Before beginning to place fill, the proposed fill materials should be sampled and tested to determine maximum dry density, optimum moisture content, natural moisture content, gradation, and plasticity of the soil. Structural soil fill material should have less than 5 percent organic matter, a standard Proctor (ASTM D698) maximum dry density of 90 pcf or greater and a plasticity index (PI) of 30 percent or less. Materials with a PI greater than 30 percent are susceptible to volume changes with changes in moisture content. Volume changes in the subgrade can cause structural distress in pavements. We recommend that any off-site borrow material also be required to meet the requirements of this section and should be tested prior to being hauled to the site. All material to be used as soil fill should be tested and approved by the geotechnical engineer before being placed.

5.3.1 Structural Fill Placement and Compaction

Structural fill should be uniformly spread in relatively thin lifts (8-inch, loose maximum) and compacted to at least 95 percent of the soil's maximum dry density (MDD) as determined by a laboratory standard Proctor compaction test (ASTM D698). The upper 1 foot should be compacted to at least 100 percent of the soil's MDD as determined by ASTM D698.

The moisture content should be controlled to within 3 percent (plus or minus) of the soil's optimum moisture content as determined by the standard Proctor test. In addition to meeting the compaction requirement, fill material should be stable under movement of the construction equipment and should not exhibit rutting or pumping.

Rainwater should not be allowed to pond on the top of the fill or on finished subgrades. In addition, we recommend the surface be "sealed" with a smooth drum roller if rain is pending to help reduce the potential for these upper soils becoming wet during rain events.

5.3.2 Observations and Testing

Fill placement should be observed by an experienced soils technician working under the guidance of the geotechnical engineer. We recommend full time observation by a qualified soils technician with testing at intervals determined by the technician (based on the materials, equipment and observed behavior) to confirm that the specified compaction is being achieved.

5.4 Excavation

If subsurface water is encountered during undercutting or other excavation, the water level should be maintained at least 1 foot below excavations to help maintain bottom stability. If encountered, water can probably be controlled at the site by pumping from sumps located within the excavations. The contractor should be responsible for any dewatering. The effects of dewatering on nearby structures should be evaluated and are the responsibility of the designer of any dewatering system.



All excavations should be sloped or shored in accordance with local, state, and federal regulations, including OSHA (29 CFR Part 1926) excavation trench safety standards. The contractor should be solely responsible for site safety. This information is provided only as a service, and under no circumstances should S&ME be assumed to be responsible for construction site safety.

5.5 Covered Dock Pile Foundation Recommendations

The proposed covered dock located on the southern edge of the park and north of the newly constructed dam may be supported on driven timber piles. We have not been provided with the anticipated pile loads or spacing. Our analyses indicates 10-inch and 12-inch tip diameter, timber piles should be feasible and compatible with providing the resistances detailed in the following tables.

Table 5-1 – 10-inch Timber Pile Design Parameters

Embedded Pile Length (feet)	Allowable Compression (kips)	Allowable Tension (kips)	Lateral Load for 1-inch Head Deflection
30	14	12	5.5
35	20	17	5.6
40	27	24	5.7

Table 5-2 – 12-inch Timber Pile Design Parameters

Embedded Pile Length (feet)	Allowable Compression (kips)	Allowable Tension (kips)	Lateral Load for 1-inch Head Deflection
30	24	20	8.1
35	34	27	8.2
40	45	37	8.2

The allowable compression and tension design parameters were calculated using a factor of safety of at least 2.75 in the static condition. The pile lengths should be ordered to anticipate that some piles may have to be driven deeper to achieve the design resistance. The structural capacity of the piles has not been considered in our analysis and must be evaluated by the project structural engineer. Prior to the start of construction, a wave equation analysis should be performed to verify that the proposed driving system (i.e., hammer type and size) is capable of driving the piles to the desired depth and resistance.

Pile driving operations should be observed by an Engineering Technician under the Geotechnical Engineer's supervision to evaluate whether the piles are encountering expected driving resistances and to note any damage



or other concerns during installation. Pre-augering may be used to aid in pile installation. Pre-augering should not be permitted beyond a depth of 5 feet below the existing ground surface. The diameter of the auger should be no larger than the least pile dimension. **Jetting should be prohibited.**

Due to the anticipated relatively light loads, load testing is not required. A higher safety factor was used in our design to compensate for the absence of load testing. However, an engineering technician should monitor the pile driving to observe that the piles are encountering expected driving resistances and note anomalies experienced during pile installation.

5.6 Flexible Pavements

It is our opinion that the flexible pavement should consist of a wearing course of hot mix asphaltic (HMA) concrete, an intermediate course of HMA concrete and a base course of either graded aggregate base, Macadam Base Course or HMA type A, B or C base material. Graded aggregate material is necessary for structural support and to help transport any rainwater that seeps below the pavement.

All materials and workmanship should meet the minimum requirements of the SCDOT *Standard Specifications for Highway Construction*, 2007 Edition and supplemental specifications. The applicable sections include the following:

Table 5-3 – SCDOT Bituminous Pavements Specifications

Section	2007 SCDOT Standard Specification Section
Subgrade	Section 208, page 130
Graded Aggregate Base Course	Section 305, page 159
Asphalt Base Course – Type C and D	Section 309, page 182
Asphalt Base Course – Type A and B	Section 310, page 186
Hot Mixed Asphalt Pavement	Section 401, page 188
Hot Mix Asphalt Surface Course	Section 403, page 220
Supplemental Specifications	
HMA Material Properties, dated March 1, 2011	

Sufficient testing should be performed during flexible pavement installation to confirm that the required thickness, density, and quality requirements of the pavement specifications are followed. This is very important for the long-term performance of the pavement, and can be performed by S&ME, Inc. as part of our construction materials testing services.

5.7 Base Course Materials

Fill placed in pavement areas should be compacted as recommended in preceding sections. Prior to pavement installation, all exposed pavement subgrades should be methodically proofrolled at final subgrade elevation under the observation of the S&ME representative, and any identified unstable areas should be repaired as directed.



As stated in the SCDOT Section 305, new base course should be compacted to at least 100 percent of the modified Proctor maximum dry density (ASTM D-1557), and should not exhibit pumping or rutting under equipment traffic. Heavy compaction equipment is likely to be required in order to achieve the required base course compaction, and the moisture content of the material will likely need to be maintained very near the optimum moisture content in order to facilitate proper compaction. Base course of greater than 8 inches total thickness must be constructed in two lifts of approximately equal thickness. S&ME, Inc. should be contacted to perform field density and thickness testing of the base course prior to paving.

6.0 Limitations of Report

This report has been prepared in accordance with generally accepted geotechnical engineering practice for specific application to this project. The conclusions and recommendations contained in this report are based upon applicable standards of our practice in this geographic area at the time this report was prepared. No other representation or warranty either express or implied, is made.

We relied on project information given to us to develop our conclusions and recommendations. If project information described in this report is not accurate, or if it changes during project development, we should be notified of the changes so that we can modify our recommendations based on this additional information if necessary.

Our conclusions and recommendations are based on limited data from a field exploration program. Subsurface conditions can vary widely between explored areas. Some variations may not become evident until construction. If conditions are encountered which appear different than those described in our report, we should be notified. This report should not be construed to represent subsurface conditions for the entire site.

Unless specifically noted otherwise, our field exploration program did not include an assessment of regulatory compliance, environmental conditions or pollutants or presence of any biological materials (mold, fungi, bacteria). If there is a concern about these items, other studies should be performed. S&ME can provide a proposal and perform these services if requested.

S&ME should be retained to review the final plans and specifications to confirm that earthwork, foundation, and other recommendations are properly interpreted and implemented. The recommendations in this report are contingent on S&ME's review of final plans and specifications followed by our observation and monitoring of earthwork and foundation construction activities.

Appendix

Appendix I – Figures

Figure 1 - Site Vicinity Map

Figure 2 - Test Location Sketch

Figure 3 - Subsurface Profile A - A'

Appendix II – Subsurface Information

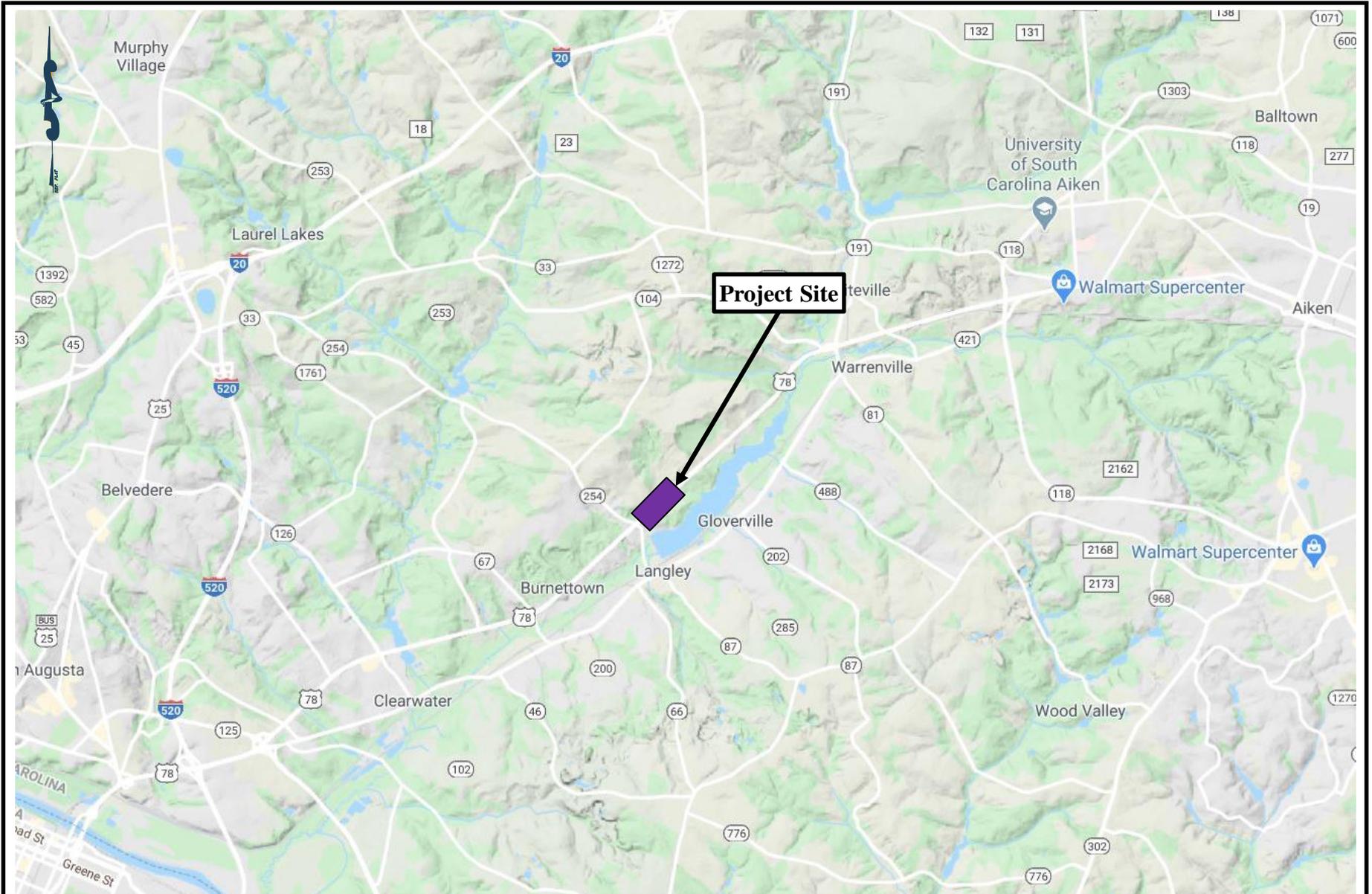
Legend to Soil Classification and Symbols

Boring Logs

Appendix III - Laboratory Testing

Appendix IV - Supplemental Information

Appendix I



Site Vicinity Map
 113 Langley Pond Dam Road
 Burrenttown, South Carolina

JOB NO.:3319-20-027

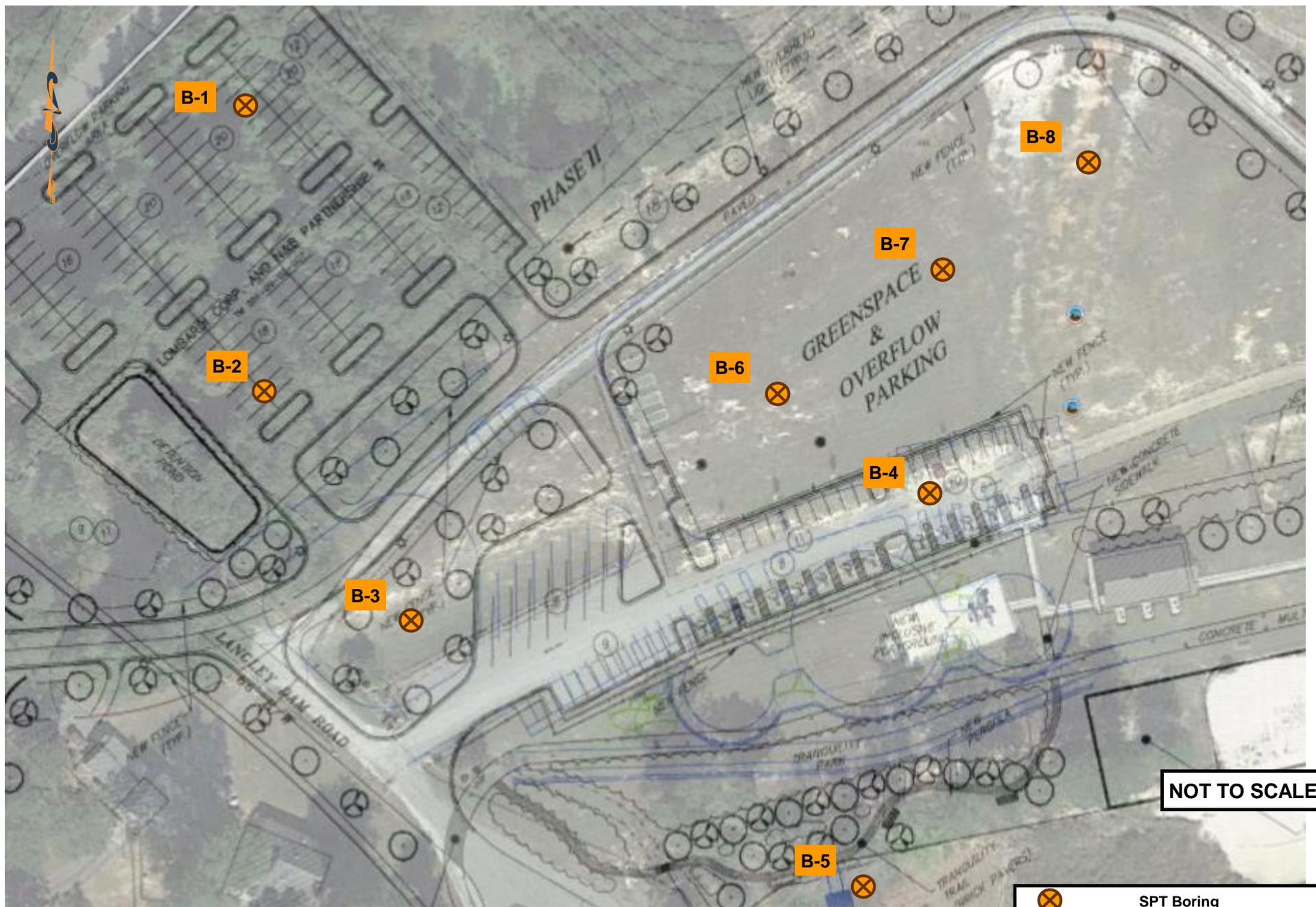
FIGURE NO.: 1

SOURCE: Google

DRAWN BY: RAW

DATE: 7/31/2020

CHECKED BY: TJM



NOT TO SCALE

 SPT Boring



Test Location Sketch
Langley Pond Park Improvements
Burnettown, South Carolina

PROJECT NO.: 3319-20-027

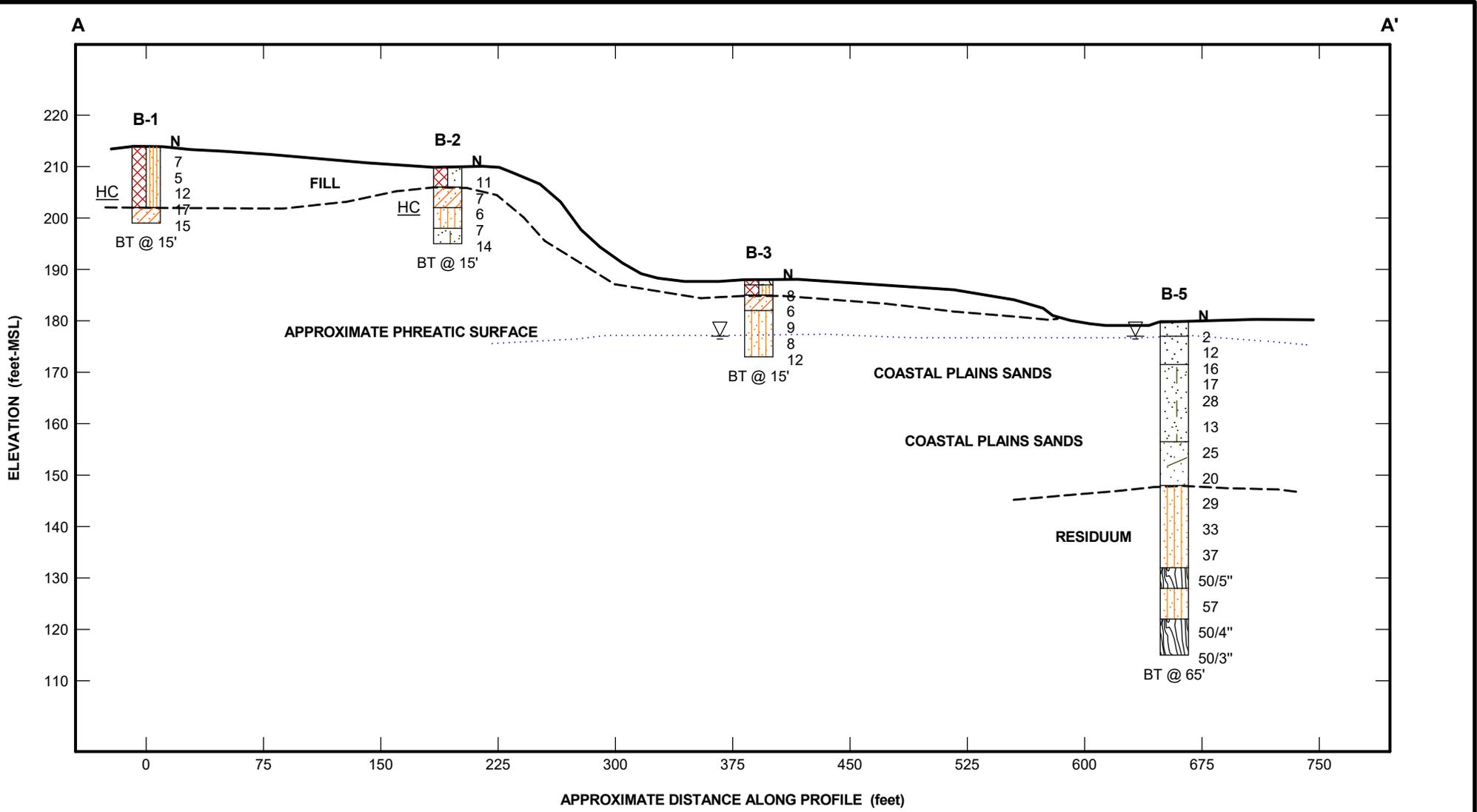
SOURCE: Alfred Benesch & Company

DATE: 7/31/2020

FIGURE NO.: 2

DRAWN BY: RAW

CHECKED BY: TJM



-  SM, Silty Sand
-  SC, Clayey Sand
-  SP/SM, Poorly-graded Sand with Silt
-  GP, Poorly-graded Gravel
-  SP, Poorly-graded Sand
-  SP/SC, Poorly-graded Sand with Clay
-  Partially Weathered Rock

N = Standard Penetration Test resistance value (blows per foot). The depicted stratigraphy is shown for illustrative purposes only. The actual subsurface conditions will vary between boring locations.

JOB NO:	3319-20-027
DATE:	7/31/20



1527 Crescent Drive

Augusta, Georgia 30809

Project: Langley Pond Park Improvements
 Profile: A - A'
 Location: Burnetown, South Carolina

Figure 3

Appendix II



LEGEND TO SOIL CLASSIFICATION AND SYMBOLS

SOIL TYPES

	Topsoil		Asphalt
	Concrete		Gravel
	Fill		Silty Sand
	Sand		Clayey Sand
	Silt		Sandy Silt
	Clay		Clayey Silt
	Fat Clay		Sandy Clay
	Lean Clay		Silty Clay
	Cored Rock		Organic
	Partially Weathered Rock		

SAMPLER TYPES

(Shown in Samples Column)

	Shelby Tube		Split Spoon
	Rock Core		No Recovery

CONSISTENCY OF COHESIVE SOILS

<i>Consistency</i>	<i>Standard Penetration Resistance Blows/Foot</i>
Very Soft	0 to 2
Soft	3 to 4
Firm	5 to 8
Stiff	9 to 15
Very Stiff	16 to 30
Hard	31 to 50
Very Hard	Over 50

RELATIVE DENSITY OF COHESIONLESS SOILS

<i>Relative Density</i>	<i>Standard Penetration Resistance Blows/Foot</i>
Very Loose	0 to 4
Loose	5 to 10
Medium Dense	11 to 30
Dense	31 to 50
Very Dense	Over 50

WATER LEVELS

(Shown in Water Level Column)

	Water Level at Termination of Boring
	Water Level Taken After 24 Hours
	Loss of Drilling Water
HC	Hole Cave

TERMS

Standard Penetration Resistance | The number of blows of a 140 lb. hammer falling 30 inches. Required to drive 1.4 inches I.D. Split Spoon sampler 1 foot. As specified in ASTM D-1586.

REC | Total length of rock recovered in the core barrel divided by the total length of the core run times 100%.

ROD | Total length of sound rock segments recovered that are longer than or equal to 4 inches (mechanical breaks excluded) divided by the total length of the core run times 100%.

DATE DRILLED: 6/26/20	ELEVATION: 214.0 ft	NOTES: Elevation estimated from Google Earth	
DRILL RIG: CME 45-B	BORING DEPTH: 15.0 ft		
DRILLER: H. Wessinger	WATER LEVEL: No water encountered.		
HAMMER TYPE: Automatic	LOGGED BY: BDF		
SAMPLING METHOD: Split spoon		NORTHING: 3709835	EASTING: 421294
DRILLING METHOD: 3/4" H.S.A.			

DEPTH (feet)	GRAPHIC LOG	MATERIAL DESCRIPTION	WATER LEVEL	ELEVATION (feet)	SAMPLE NO.	SAMPLE TYPE	BLOW COUNT / CORE DATA			STANDARD PENETRATION TEST DATA (blows/ft) /REMARKS					N VALUE
							1st 6in / RUN #	2nd 6in / REC	3rd 6in / RQD	10	20	30	6080		
5	[Cross-hatch pattern]	FILL: SILTY SAND (SM) fine to medium grained sand, moist, dark gray, some organics, loose --- Trace mica --- Medium dense	HC	209.0	1	[Symbol]	3	3	4						7
10	[Cross-hatch pattern]			204.0	2	[Symbol]	2	2	3						5
15	[Cross-hatch pattern]				3	[Symbol]	3	4	8						12
20	[Cross-hatch pattern]				4	[Symbol]	3	5	12						17
25	[Cross-hatch pattern]				5	[Symbol]	4	6	9						15
15	[Diagonal lines]	COASTAL PLAIN: CLAYEY SAND (SC) fine to medium sand, moist, light reddish brown, medium dense		199.0											
		Boring terminated at 15 ft													

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3. STRATIFICATION AND GROUNDWATER DEPTHS ARE NOT EXACT.
4. WATER LEVEL IS AT TIME OF EXPLORATION AND WILL VARY.



DATE DRILLED: 6/26/20	ELEVATION: 210.0 ft	NOTES: Elevation estimated from Google Earth	
DRILL RIG: CME 45-B	BORING DEPTH: 15.0 ft		
DRILLER: H. Wessinger	WATER LEVEL: No water encountered.		
HAMMER TYPE: Automatic	LOGGED BY: BDF		
SAMPLING METHOD: Split spoon		NORTHING: 3709786	EASTING: 421299
DRILLING METHOD: 3 1/4" H.S.A.			

DEPTH (feet)	GRAPHIC LOG	MATERIAL DESCRIPTION	WATER LEVEL	ELEVATION (feet)	SAMPLE NO.	SAMPLE TYPE	BLOW COUNT / CORE DATA			STANDARD PENETRATION TEST DATA (blows/ft) /REMARKS				N VALUE	
							1st 6in / RUN #	2nd 6in / REC	3rd 6in / RQD	10	20	30	6080		
1		FILL: POORLY GRADED SAND WITH SILT (SP-SM) fine to medium sand, little gravel, wet, light gray, medium dense, some organics		210.0	1	▲	3	4	7	●					11
5		COASTAL PLAIN: CLAYEY SAND (SC) fine to coarse sand, moist, white, loose		205.0	2	▲	3	3	4	●					7
10		COASTAL PLAIN: SILTY SAND (SM) fine to medium sand, moist, gray, loose	HC	200.0	3	▲	3	3	3	●					6
15		COASTAL PLAIN: POORLY GRADED SILTY SAND (SP-SM) fine to medium sand, moist, light reddish brown, medium dense		195.0	4	▲	2	3	4	●					7
15		Boring terminated at 15 ft			5	▲	4	6	8	●					14

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PROJECT: Langley Pond Park Improvements Burnettown, South Carolina S&ME Project No. 3319-20-027		BORING LOG B-3												
DATE DRILLED: 6/26/20	ELEVATION: 188.0 ft	NOTES: Elevation estimated from Google Earth												
DRILL RIG: CME 45-B	BORING DEPTH: 15.0 ft													
DRILLER: H. Wessinger	WATER LEVEL: 11' ATD													
HAMMER TYPE: Automatic	LOGGED BY: BDF													
SAMPLING METHOD: Split spoon		NORTHING: 3709739	EASTING: 421328											
DRILLING METHOD: 3/4" H.S.A.														
DEPTH (feet)	GRAPHIC LOG	MATERIAL DESCRIPTION	WATER LEVEL ELEVATION (feet)	SAMPLE NO.	SAMPLE TYPE	BLOW COUNT / CORE DATA			STANDARD PENETRATION TEST DATA (blows/ft) /REMARKS				N VALUE	
						1st 6in / RUN #	2nd 6in / REC	3rd 6in / RQD	10	20	30	6080		
1		FILL: POORLY GRADED GRAVEL WITH SAND (GP) little fine to medium sand, brick, concrete, and deleterious debris, moist, brown and gray, loose			▲	4	3	5						8
5		FILL: SILTY SAND (SM) fine to medium sand, brick and deleterious debris, moist, brown, loose			▲	3	3	3						6
10		COASTAL PLAIN: CLAYEY SAND (SC) fine to medium sand, moist, gray, loose, little organics			▲	2	5	4						9
15		COASTAL PLAIN: SILTY SAND (SM) fine to medium sand, moist, grayish brown, loose --- Light brown	▽ 178.0		▲	3	4	4						8
15		--- Medium dense Boring terminated at 15 ft	173.0		▲	2	5	7						12

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PROJECT: Langley Pond Park Improvements Burnettown, South Carolina S&ME Project No. 3319-20-027		BORING LOG B-4													
DATE DRILLED: 6/26/20	ELEVATION: 193.0 ft	NOTES: Elevation estimated from Google Earth													
DRILL RIG: CME 45-B	BORING DEPTH: 15.0 ft														
DRILLER: H. Wessinger	WATER LEVEL: No water encountered.														
HAMMER TYPE: Automatic	LOGGED BY: BDF														
SAMPLING METHOD: Split spoon		NORTHING: 3709772	EASTING: 421450												
DRILLING METHOD: 3/4" H.S.A.															
DEPTH (feet)	GRAPHIC LOG	MATERIAL DESCRIPTION	WATER LEVEL	ELEVATION (feet)	SAMPLE NO.	SAMPLE TYPE	BLOW COUNT / CORE DATA			STANDARD PENETRATION TEST DATA (blows/ft) /REMARKS				N VALUE	
							1st 6in / RUN #	2nd 6in / REC	3rd 6in / RQD	10	20	30	6080		
0 - 1		FILL: SILTY SAND (SM) fine sand with organics, very wet, black, loose			1	▲▼	6	3	4						7
1 - 5		COASTAL PLAIN: SILTY SAND (SM) fine to medium sand, moist, grayish brown, medium dense --- Brown --- Loose	HC	188.0	2	▲▼	6	8	7						15
5 - 10				183.0	3	▲▼	4	6	9						15
10 - 15				183.0	4	▲▼	2	3	3						6
15 - 15		COASTAL PLAIN: CLAYEY SAND (SC) fine to medium sand, moist, tan, loose		178.0	5	▲▼	3	4	6						10
		Boring terminated at 15 ft													

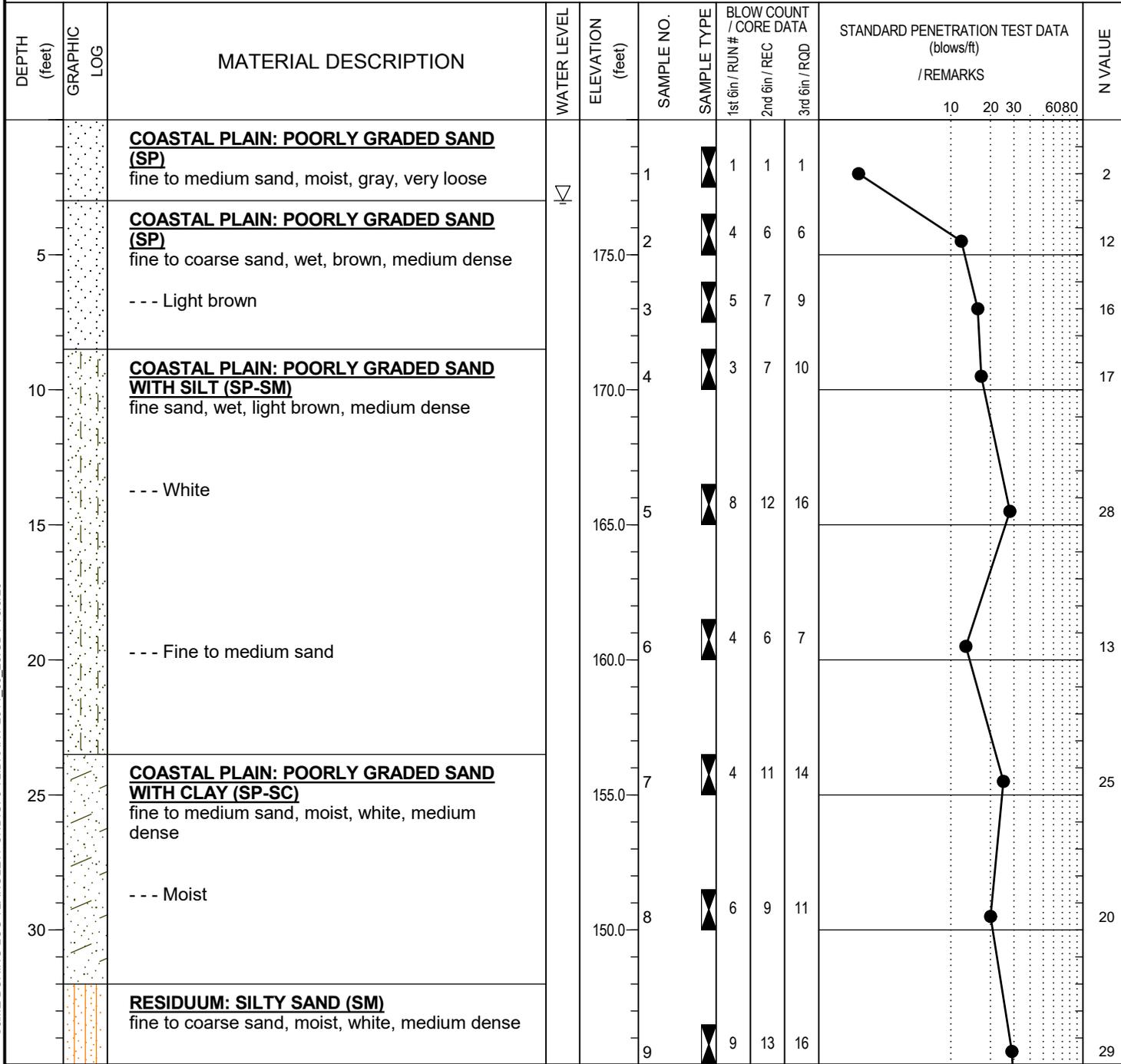
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DATE DRILLED: 6/26/20	ELEVATION: 180.0 ft	NOTES: Elevation estimated from Google Earth
DRILL RIG: CME 45-B	BORING DEPTH: 65.0 ft	
DRILLER: H. Wessinger	WATER LEVEL: 3' ATD	
HAMMER TYPE: Automatic	LOGGED BY: BDF	
SAMPLING METHOD: Split spoon		NORTHING: 3709698
DRILLING METHOD: 3/4" H.S.A.		EASTING: 421413



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PROJECT: Langley Pond Park Improvements Burnettown, South Carolina S&ME Project No. 3319-20-027				BORING LOG B-5											
DATE DRILLED: 6/26/20		ELEVATION: 180.0 ft		NOTES: Elevation estimated from Google Earth											
DRILL RIG: CME 45-B		BORING DEPTH: 65.0 ft													
DRILLER: H. Wessinger		WATER LEVEL: 3' ATD													
HAMMER TYPE: Automatic		LOGGED BY: BDF													
SAMPLING METHOD: Split spoon				NORTHING: 3709698		EASTING: 421413									
DRILLING METHOD: 3/4" H.S.A.															
DEPTH (feet)	GRAPHIC LOG	MATERIAL DESCRIPTION	WATER LEVEL	ELEVATION (feet)	SAMPLE NO.	SAMPLE TYPE	BLOW COUNT / CORE DATA			STANDARD PENETRATION TEST DATA (blows/ft) /REMARKS				N VALUE	
							1st 6in / RUN #	2nd 6in / REC	3rd 6in / RQD	10	20	30	6080		
40		RESIDUUM: SILTY SAND (SM) fine to coarse sand, moist, white, medium dense <i>(continued)</i> --- Dense		140.0	10	12	14	19							33
45				135.0	11	10	17	20							37
50		PARTIALLY WEATHERED ROCK: SAMPLED AS SILTY SAND (SM) fine to coarse sand, moist, white and brown, very dense		130.0	12	31	50	50/5"							50/5"
55		SILTY SAND (SM) fine to coarse sand, moist, light brown, relic rock fabric, very dense		125.0	13	19	22	35							57
60		PARTIALLY WEATHERED ROCK: SAMPLED AS SILTY SAND (SM) fine to medium sand, moist, micaceous, dark gray, very dense		120.0	14	29	50/4"								50/4"
65		Boring terminated at 65 ft		115.0		50/3"									50/3"

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4. WATER LEVEL IS AT TIME OF EXPLORATION AND WILL VARY.



PROJECT: Langley Pond Park Improvements Burnettown, South Carolina S&ME Project No. 3319-20-027		BORING LOG B-6												
DATE DRILLED: 6/26/20		ELEVATION: 195.0 ft												
DRILL RIG: CME 45-B		BORING DEPTH: 5.0 ft												
DRILLER: H. Wessinger		WATER LEVEL: No water encountered.												
HAMMER TYPE: Automatic		LOGGED BY: BDF												
SAMPLING METHOD: Split spoon		NORTHING: 3709778	EASTING: 421394											
DRILLING METHOD: 3/4" H.S.A.														
DEPTH (feet)	GRAPHIC LOG	MATERIAL DESCRIPTION	WATER LEVEL	ELEVATION (feet)	SAMPLE NO.	SAMPLE TYPE	BLOW COUNT / CORE DATA			STANDARD PENETRATION TEST DATA (blows/ft) /REMARKS				N VALUE
							1st 6in / RUN #	2nd 6in / REC	3rd 6in / RQD	10	20	30	6080	
		FILL: SILTY SAND (SM) fine to medium sand, rock and debris, moist, dark gray, loose		1		▲	3	6	3					9
5		COASTAL PLAIN: SILTY SAND (SM) fine to medium sand, moist, brown, medium dense Boring terminated at 5 ft		190.0	2	▲	2	4	7					11

S&ME BORING LOG \LANGLEYPOND.GPJ \ LIBRARY 2011_06_28.GDT \ 8/6/20

NOTES:

1. THIS LOG IS ONLY A PORTION OF A REPORT PREPARED FOR THE NAMED PROJECT AND MUST ONLY BE USED TOGETHER WITH THAT REPORT.
2. BORING, SAMPLING AND PENETRATION TEST DATA IN GENERAL ACCORDANCE WITH ASTM D-1586.
3. STRATIFICATION AND GROUNDWATER DEPTHS ARE NOT EXACT.
4. WATER LEVEL IS AT TIME OF EXPLORATION AND WILL VARY.



DEPTH (feet)		GRAPHIC LOG	MATERIAL DESCRIPTION	WATER LEVEL	ELEVATION (feet)	SAMPLE NO.	SAMPLE TYPE	BLOW COUNT / CORE DATA			STANDARD PENETRATION TEST DATA (blows/ft) /REMARKS				N VALUE
								1st 6in / RUN #	2nd 6in / REC	3rd 6in / RQD	10	20	30	6080	
5			FILL: SILTY SAND (SM) fine to medium sand, rock and debris, moist, dark gray, loose COASTAL PLAIN: SILTY SAND (SM) fine to medium sand, moist, brown, loose Boring terminated at 5 ft		195.0	1	2	3	5					8	
						2	3	3	4					7	

NOTES:

1. THIS LOG IS ONLY A PORTION OF A REPORT PREPARED FOR THE NAMED PROJECT AND MUST ONLY BE USED TOGETHER WITH THAT REPORT.
2. BORING, SAMPLING AND PENETRATION TEST DATA IN GENERAL ACCORDANCE WITH ASTM D-1586.
3. STRATIFICATION AND GROUNDWATER DEPTHS ARE NOT EXACT.
4. WATER LEVEL IS AT TIME OF EXPLORATION AND WILL VARY.



S&ME BORING LOG: \LANGLEYPOND.GPJ\ LIBRARY 2011_06_28.GDT.1.8/6/20

PROJECT: Langley Pond Park Improvements Burnettown, South Carolina S&ME Project No. 3319-20-027		BORING LOG B-8												
DATE DRILLED: 6/26/20		ELEVATION: 204.0 ft												
DRILL RIG: CME 45-B		BORING DEPTH: 5.0 ft												
DRILLER: H. Wessinger		WATER LEVEL: No water encountered.												
HAMMER TYPE: Automatic		LOGGED BY: BDF												
SAMPLING METHOD: Split spoon		NORTHING: 3709824	EASTING: 421474											
DRILLING METHOD: 3/4" H.S.A.														
DEPTH (feet)	GRAPHIC LOG	MATERIAL DESCRIPTION	WATER LEVEL	ELEVATION (feet)	SAMPLE NO.	SAMPLE TYPE	BLOW COUNT / CORE DATA			STANDARD PENETRATION TEST DATA (blows/ft) /REMARKS				N VALUE
							1st 6in / RUN #	2nd 6in / REC	3rd 6in / RQD	10	20	30	6080	
1		FILL: SILTY SAND (SM) fine to medium sand, rock and debris, moist, grayish brown, loose				▲	3	4	3					7
2		COASTAL PLAIN: POORLY GRADED SAND (SP) fine to medium sand, moist, tan, medium dense		199.0		▲	3	5	6					11
5		Boring terminated at 5 ft												

S&ME BORING LOG \LANGLEYPOND.GPJ \ LIBRARY 2011_06_28.GDT \ 8/6/20

NOTES:

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2. BORING, SAMPLING AND PENETRATION TEST DATA IN GENERAL ACCORDANCE WITH ASTM D-1586.
3. STRATIFICATION AND GROUNDWATER DEPTHS ARE NOT EXACT.
4. WATER LEVEL IS AT TIME OF EXPLORATION AND WILL VARY.



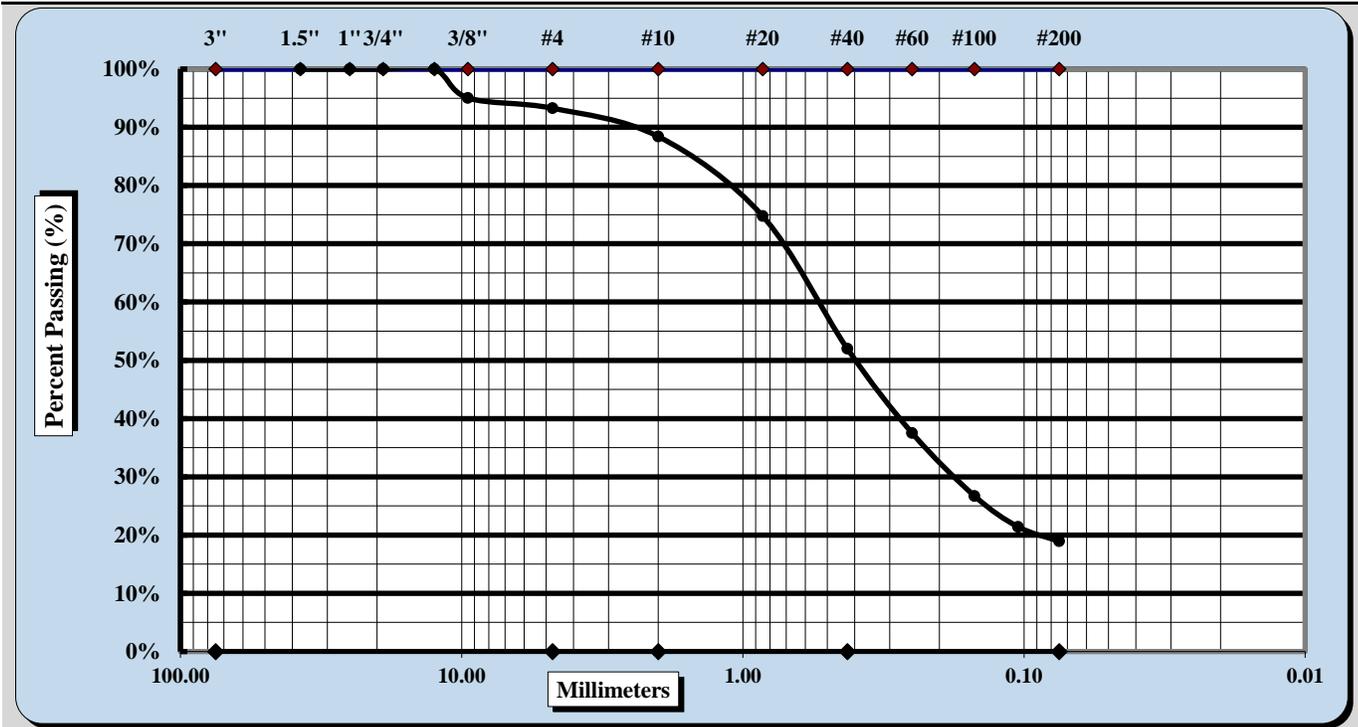
Appendix III



ASTM D 422

S&ME, Inc. - Augusta: 1527 Crescent Drive, Augusta, GA 30909

Project #:	3319-20-027	Report Date:	7/28/20
Project Name:	Langley Pond Park Imporvements	Test Date(s):	7/17/2020 - 7/28/2020
Client Name:	Alfred Benesch & Company		
Client Address:	1005 Broad Street, Augusta, GA 30901		
Boring:	B-1	Sample #:	2
		Sample Date:	6/26/2020
Depth:	3.5'-5'	Offset:	Elevation:
<i>Sample Description:</i> Dark gray silty SAND (SM)			



Cobbles	< 300 mm (12") and > 75 mm (3")	Fine Sand	< 0.425 mm and > 0.075 mm
Gravel	< 75 mm and > 4.75 mm (#4)	Silt	< 0.075 and > 0.005 mm
Coarse Sand	< 4.75 mm and > 2.00 mm (#10)	Clay	< 0.005 mm
Medium Sand	< 2.00 mm and > 0.425 mm (#40)	Colloids	< 0.001 mm

Maximum Particle Size	12.50 mm	Coarse Sand	13.7%	Fine Sand	18.6%
Gravel	11.6%	Medium Sand	37.2%	Silt & Clay	18.9%
Liquid Limit	NT	Plastic Limit	NT	Plastic Index	NT
Specific Gravity		Cc =	NA	Cu =	NA
				Moisture Content	16.5%
Coarse Sand	13.7%	Medium Sand	37.2%	Fine Sand	18.6%
Description of Sand & Gravel Particles:		Rounded	<input checked="" type="checkbox"/>	Angular	<input type="checkbox"/>
Hard & Durable	<input type="checkbox"/>	Soft	<input type="checkbox"/>	Weathered & Friable	<input checked="" type="checkbox"/>

Notes / Deviations / References:

Robert A. Williamson, P.E.
Technical Responsibility

Signature

Senior Engineer
Position

7/28/2020
Date

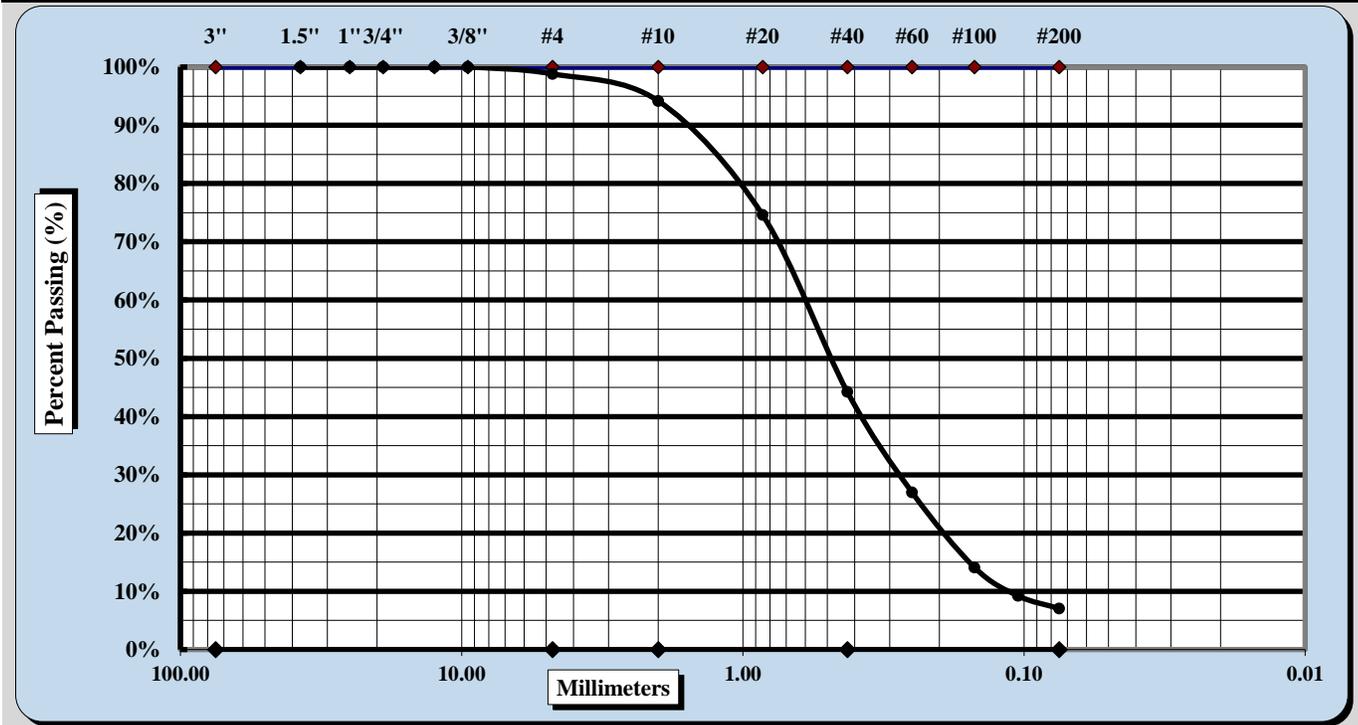
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ASTM D 422

S&ME, Inc. - Augusta: 1527 Crescent Drive, Augusta, GA 30909

Project #:	3319-20-027	Report Date:	7/28/20
Project Name:	Langley Pond Park Imporvements	Test Date(s):	7/17/2020 - 7/28/20
Client Name:	Alfred Benesch & Company		
Client Address:	1005 Broad Street, Augusta, GA 30901		
Boring:	B-2	Sample #:	1
		Sample Date:	6/26/2020
Depth:	1'-2.5'	Offset:	Elevation:
Sample Description: Light gray, poorly graded SAND with silt and organics (SP-SM)			



Cobbles	< 300 mm (12") and > 75 mm (3")	Fine Sand	< 0.425 mm and > 0.075 mm
Gravel	< 75 mm and > 4.75 mm (#4)	Silt	< 0.075 and > 0.005 mm
Coarse Sand	< 4.75 mm and > 2.00 mm (#10)	Clay	< 0.005 mm
Medium Sand	< 2.00 mm and > 0.425 mm (#40)	Colloids	< 0.001 mm

Maximum Particle Size	9.50 mm	Coarse Sand	19.6%	Fine Sand	19.9%
Gravel	5.8%	Medium Sand	47.6%	Silt & Clay	7.0%
Liquid Limit	NT	Plastic Limit	NT	Plastic Index	NT
Specific Gravity		Cc = 1.3	Cu = 5.5	Moisture Content	59.6%
Coarse Sand	19.6%	Medium Sand	47.6%	Fine Sand	19.9%
Description of Sand & Gravel Particles:		Rounded	<input checked="" type="checkbox"/>	Angular	<input type="checkbox"/>
Hard & Durable	<input type="checkbox"/>	Soft	<input type="checkbox"/>	Weathered & Friable	<input checked="" type="checkbox"/>

Notes / Deviations / References:

<u>Robert A. Williamson, P.E.</u>		<u>Senior Engineer</u>	<u>7/28/2020</u>
Technical Responsibility	Signature	Position	Date

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MOISTURE - DENSITY REPORT

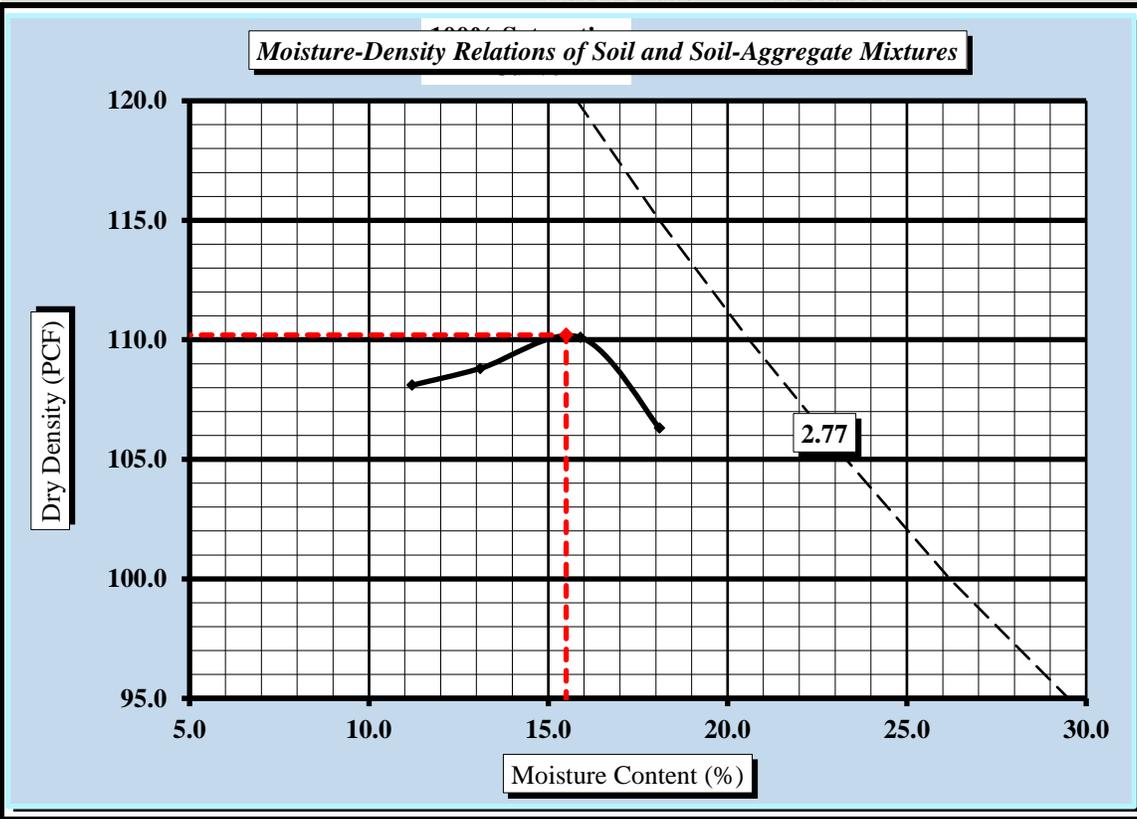


Quality Assurance

S&ME, Inc. - Columbia: 134 Suber Road, Columbia, SC 29210			
S&ME Project #:	3319-20-027	Report Date:	7/28/2020
Project Name:	Langley Pond Park Improvements	Test Date(s):	7/2 - 7/17/20
Client Name:	Alfred Benesch & Company		
Client Address:	1005 Broad Street, Augusta, Georgia		
Boring #:	2	Sample #:	Bulk 1
Location:		Sample Date:	6/26/2020
		Offset:	n/a
		Depth:	1 - 5 ft.
Sample Description:	Silty SAND (SM), tan - light brown, micaceous		

Maximum Dry Density 110.2 PCF. Optimum Moisture Content 15.5%

ASTM D 698 - - Method A



Soil Properties	
Natural	
Moisture Content	22.2%
Liquid Limit	34
Plastic Limit	26
Plastic Index	8
% Passing	
3/4"	100.0%
3/8"	98.6%
#4	97.4%
#10	92.7%
#40	54.6%
#60	40.9%
#200	26.6%
Oversize Fraction	
Bulk Gravity	
% Absorption	
% Oversize	2.6%
MDD	
Opt. MC	

Moisture-Density Curve Displayed: Fine Fraction Corrected for Oversize Fraction (ASTM D 4718)
 Sieve Size used to separate the Oversize Fraction: #4 Sieve 3/8 inch Sieve 3/4 inch Sieve
 Mechanical Rammer Manual Rammer Moist Preparation Dry Preparation

References / Comments / Deviations:

ASTM D 2216: Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass
 ASTM D 698: Laboratory Compaction Characteristics of Soil Using Standard Effort

Robert A. Williamson, P.E.  Senior Engineer 7/28/2020
 Technical Responsibility Signature Position Date

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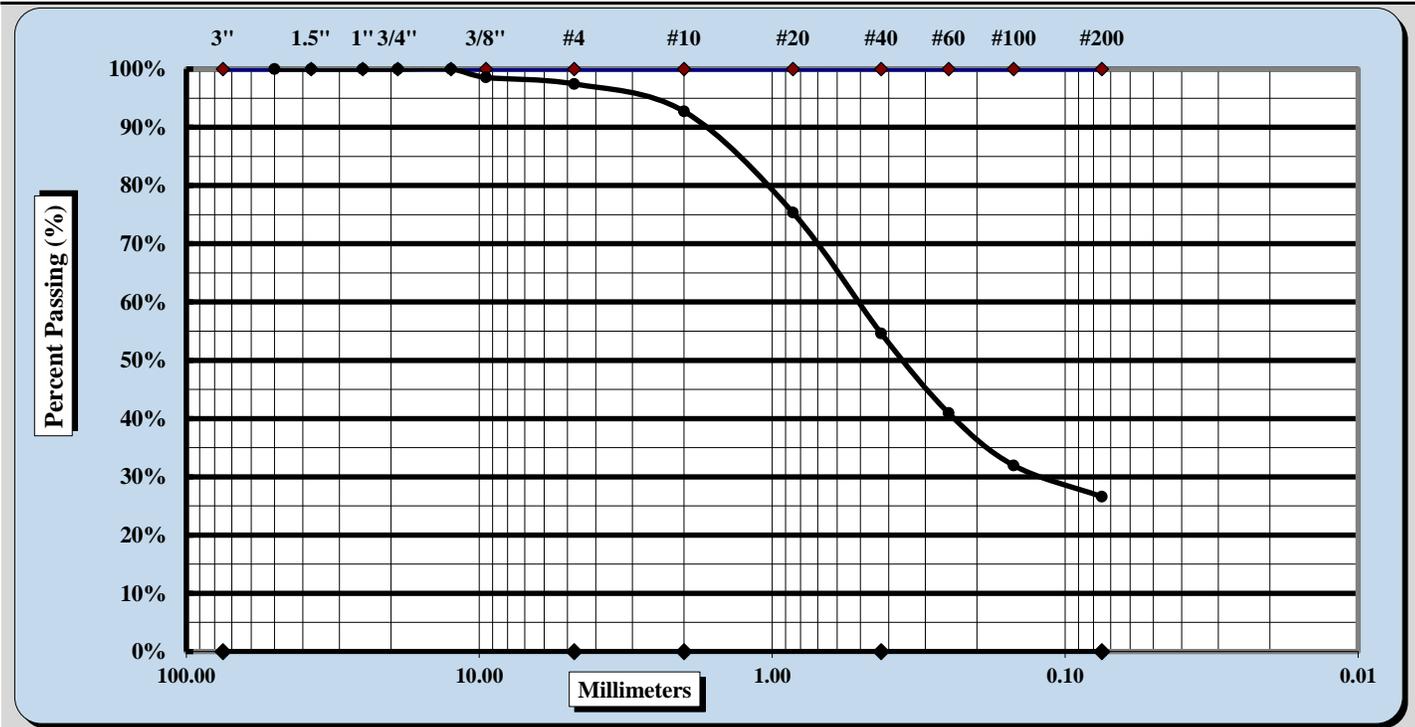


ASTM D 422 / D 6913

S&ME, Inc. - Columbia: 134 Suber Road, Columbia, SC 29210

Project #:	3319-20-027	Report Date:	7/28/2020
Project Name:	Langley Pond Park Improvements	Test Date(s):	7/2 - 7/18/20
Client Name:	Alfred Benesch & Company		
Client Address:	1005 Broad Street, Augusta, Georgia		
Sample Id.	B-2 Bulk 1	Type:	Soil
		Sample Date:	6/26/2020
Location:		Sample:	Bulk 1
		Elevation:	

Sample Description: Silty SAND (SM)



Cobbles	< 300 mm (12") and > 75 mm (3")	Fine Sand	< 0.425 mm and > 0.075 mm
Gravel	< 75 mm and > 4.75 mm (#4)	Silt	< 0.075 and > 0.005 mm
Coarse Sand	< 4.75 mm and > 2.00 mm (#10)	Clay	< 0.005 mm
Medium Sand	< 2.00 mm and > 0.425 mm (#40)	Colloids	< 0.001 mm

Maximum Particle Size	3/8"	Coarse Sand	4.7%	Fine Sand	28.1%
Gravel	2.6%	Medium Sand	38.1%	Silt & Clay	26.6%
Liquid Limit	34	Plastic Limit	26	Plastic Index	8
Specific Gravity	TNP			Moisture Content	22.2%
Coarse Sand	4.7%	Medium Sand	38.1%	Fine Sand	28.1%
Description of Sand & Gravel Particles:		Rounded	<input type="checkbox"/>	Angular	<input checked="" type="checkbox"/>
Hard & Durable	<input checked="" type="checkbox"/>	Soft	<input type="checkbox"/>	Weathered & Friable	<input checked="" type="checkbox"/>

Notes / Deviations / References:

Robert A. Williamson, P.E.

Technical Responsibility

Signature

Senior Engineer

Position

7/28/2020

Date

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LIQUID LIMIT, PLASTIC LIMIT, & PLASTIC INDEX



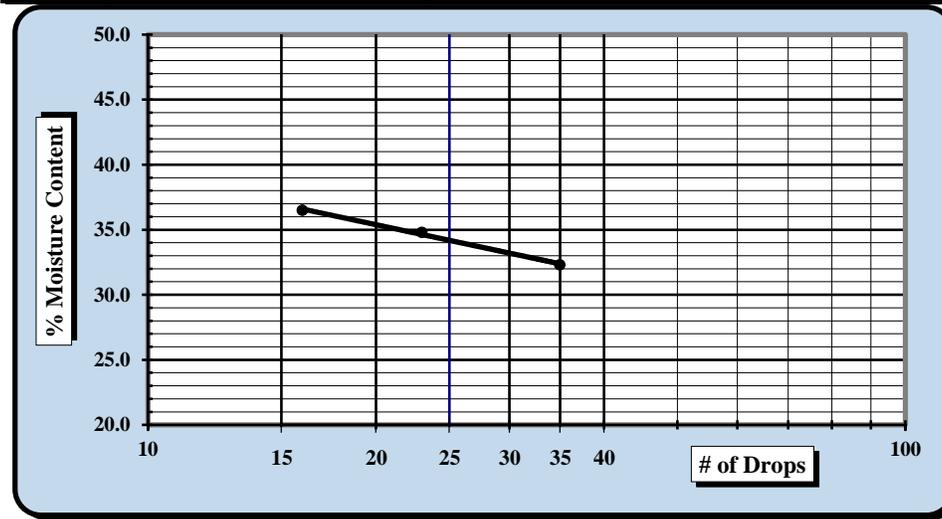
ASTM D 4318 AASHTO T 89 AASHTO T 90

S&ME, Inc. - Columbia: 134 Suber Road, Columbia, SC 29210

Project #:	3319-20-027	Report Date:	7/28/2020
Project Name:	Langley Pond Park Improvements	Test Date(s)	7/2 - 7/8/20
Client Name:	Alfred Benesch & Company		
Client Address:	1005 Broad Street, Augusta, Georgia		
Boring #:	#2	Sample #:	Bulk 1
		Sample Date:	6/26/20
Location:	Offset: n/a	Elevation:	

Sample Description: Silty SAND (SM)					
Type and Specification	S&ME ID #	Cal Date:	Type and Specification	S&ME ID #	Cal Date:
Balance (0.01 g)	15425	8/5/2019	Flat Grooving tool	28708	3/9/2020
LL Apparatus	28651	5/20/2020			
Oven	25722	8/5/2019	No. 40 Sieve	21775	1/2/2020

Pan #	Tare #:	Liquid Limit					Plastic Limit		
		39	1	235			13	210	
A	Tare Weight	20.81	20.66	20.76			20.88	20.92	
B	Wet Soil Weight + A	30.97	27.36	27.27			28.57	28.88	
C	Dry Soil Weight + A	28.49	25.63	25.53			26.96	27.25	
D	Water Weight (B-C)	2.48	1.73	1.74			1.61	1.63	
E	Dry Soil Weight (C-A)	7.68	4.97	4.77			6.08	6.33	
F	% Moisture (D/E)*100	32.3%	34.8%	36.5%			26.5%	25.8%	
N	# OF DROPS	35	23	16			Moisture Contents determined by ASTM D 2216		
LL	LL = F * FACTOR								
Ave.	Average						26.2%		



One Point Liquid Limit			
N	Factor	N	Factor
20	0.974	26	1.005
21	0.979	27	1.009
22	0.985	28	1.014
23	0.99	29	1.018
24	0.995	30	1.022
25	1.000		

NP, Non-Plastic

Liquid Limit **34**

Plastic Limit **26**

Plastic Index **8**

Group Symbol **ML**

Multipoint Method

One-point Method

Wet Preparation Dry Preparation Air Dried Percent Passing the No. 200 sieve: 27%

Notes / Deviations / References: Group Symbol refers to material passing the #40 sieve.

ASTM D 4318: Liquid Limit, Plastic Limit, & Plastic Index of Soils

Matthew Wolfe
Technician Name

7/8/2020
Date

Robert A. Williamson, P.E.
Technical Responsibility

7/28/2020
Date

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CBR (CALIFORNIA BEARING RATIO) OF LABORATORY COMPACTED SOIL



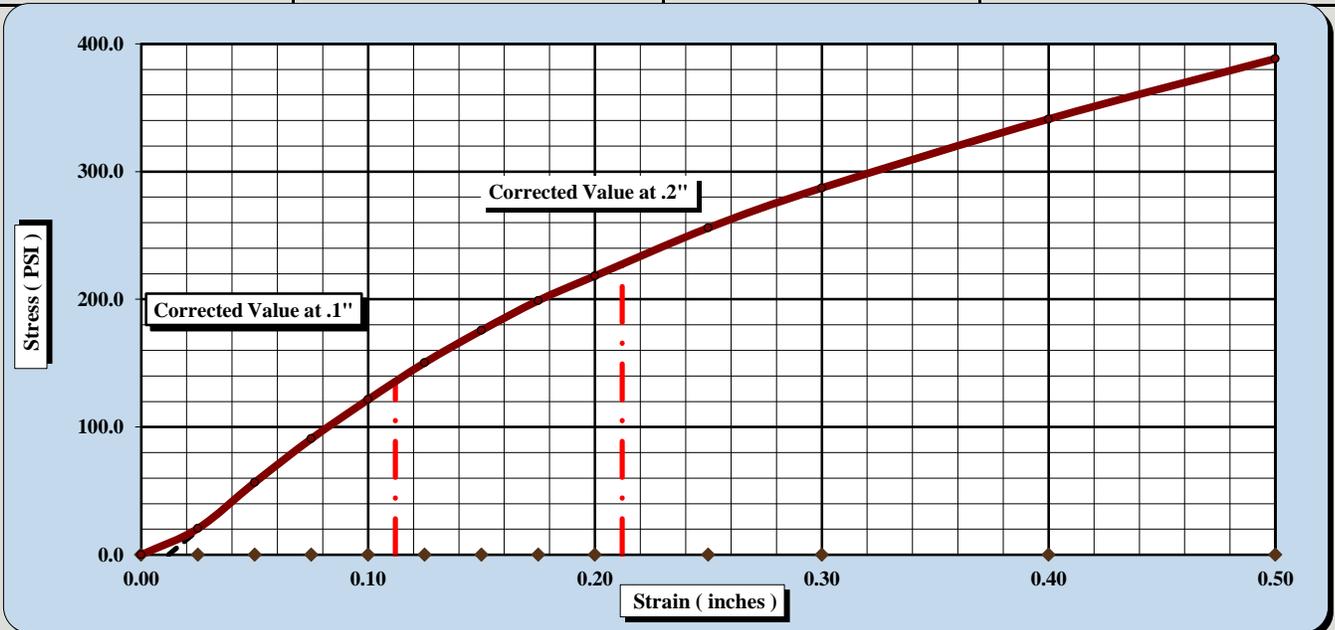
ASTM D 1883

S&ME, Inc. - Columbia: 134 Suber Road, Columbia, SC 29210

Project #:	3319-20-027	Report Date:	7/14/2020
Project Name:	Langley Pond Park Improvements	Test Date(s)	7/10 - 7/14/20
Client Name:	Alfred Benesch & Company		
Client Address:	1005 Broad Street, Augusta, Georgia		
Boring #:	#2	Sample #:	Bulk 1
		Sample Date:	6/26/20
Location:	Offset: n/a	Depth:	1 - 5 ft.
Sample Description: Silty SAND (SM), tan - light brown, micaceous			

ASTM D 698 Method A Maximum Dry Density: 110.2 PCF Optimum Moisture Content: 15.5%
 Compaction Test performed on the Fine Fraction only % Retained on the #4 sieve: 2.6%

Uncorrected CBR Values		Corrected CBR Values	
CBR at 0.1 in.	12.1	CBR at 0.2 in.	15.2
	14.6	13.7	



CBR Sample Preparation: Performed on the fine fraction
 Grading was in accordance with the above method and compacted using the 6" diameter CBR mold. ASTM D1883, Section 6.1.1

Before Soaking		After Soaking	
Compactive Effort (Blows per Layer)	36	Final Dry Density (PCF)	108.8
Initial Dry Density (PCF)	109.2	Moisture Content (top 1" after soaking)	18.1%
Moisture Content of the Compacted Specimen	15.1%	Percent Swell	0.4%
Percent Compaction	99.1%		

Soak Time: 96 hrs. Surcharge Weight: 10.0 Surcharge Wt. per sq. Ft.: 50.9
 Liquid Limit: 34 Plastic Index: 8

Notes/Deviations/References: Liquid Limit: ASTM D 4318, Classification: ASTM D 2487

Robert A. Williamson, P.E.
 Technical Responsibility

Signature

Senior Engineer
 Position

7/28/2020
 Date

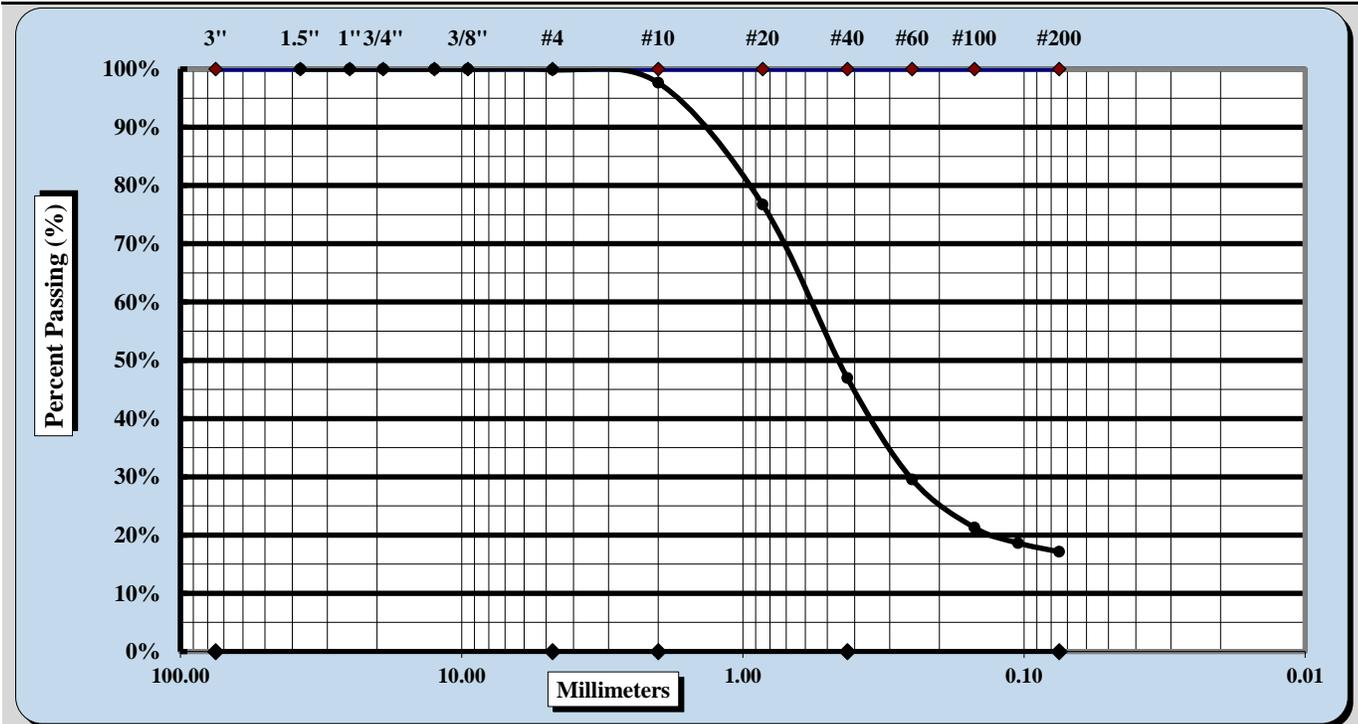
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ASTM D 422

S&ME, Inc. - Augusta: 1527 Crescent Drive, Augusta, GA 30909

Project #:	3319-20-027	Report Date:	7/28/20
Project Name:	Langley Pond Park Imporvements	Test Date(s):	7/17/2020 - 7/28/20
Client Name:	Alfred Benesch & Company		
Client Address:	1005 Broad Street, Augusta, GA 30901		
Boring:	B-3	Sample #:	3
Depth:	6'-7.5'	Sample Date:	6/26/2020
		Offset:	Elevation:
Sample Description: Grayish brown silty SAND (SM)			



Cobbles	< 300 mm (12") and > 75 mm (3")	Fine Sand	< 0.425 mm and > 0.075 mm
Gravel	< 75 mm and > 4.75 mm (#4)	Silt	< 0.075 and > 0.005 mm
Coarse Sand	< 4.75 mm and > 2.00 mm (#10)	Clay	< 0.005 mm
Medium Sand	< 2.00 mm and > 0.425 mm (#40)	Colloids	< 0.001 mm

Maximum Particle Size	9.50 mm	Coarse Sand	20.9%	Fine Sand	12.4%
Gravel	2.4%	Medium Sand	47.2%	Silt & Clay	17.1%
Liquid Limit	NT	Plastic Limit	NT	Plastic Index	NT
Specific Gravity		Cc =	NA	Cu =	NA
				Moisture Content	13.0%
Coarse Sand	20.9%	Medium Sand	47.2%	Fine Sand	12.4%
Description of Sand & Gravel Particles:		Rounded	<input checked="" type="checkbox"/>	Angular	<input type="checkbox"/>
Hard & Durable	<input type="checkbox"/>	Soft	<input type="checkbox"/>	Weathered & Friable	<input checked="" type="checkbox"/>

Notes / Deviations / References:

Robert A. Williamson, P.E.
Technical Responsibility

Signature

Senior Engineer
Position

7/28/2020
Date

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MOISTURE, ASH, AND ORGANIC MATTER



ASTM D-2974

S&ME, Inc. - Augusta: 1527 Crescent Drive, Augusta, GA 30909

Project #:	3319-20-027	Report Date:	7/28/20
Project Name:	Langley Pond Park Improvements	Test Date(s):	7/17/2020
Client Name:	Alfred Benesch & Company		
Client Address:	1005 Broad Street, Augusta, GA 30901		
Boring No.	B-4	Sample No.	1
		Sample Date:	6/26/2020
Location:	1'-2.5'	Sampled by:	Elevation:
Sample Description: Black, silty SAND with organics (SM)			
Equipment: Balance: 0.01 g. Readability, 500g. Minimum Capacity			
Balance:	S&ME ID #:	Cal. Date:	Due:

Method A: Moisture Content Determination

Required Oven Temperature: 105 ± 5 °C

Oven Temperature: 105 °C		Tare #	C-02
t	Tare Weight (Dish plus Aluminum Foil Cover)	grams	74.83
a	Mass of As-Received Specimen + Tare Wt.	grams	123.74
b	Mass of Oven Dry Specimen + Tare Wt.	grams	99.69
w	Water Weight	(a-b)	24.05
A	Mass of As-Received Specimen	(a-t)	48.91
B	Mass of Oven Dry Specimen	(b-t)	24.86
% Moisture Content as a % of As Received or Total Mass		(w/A)*100	49.2%
% Moisture Content as a % of Oven-dried Mass		(w/B)*100	96.7%

Oven	S&ME ID #:	Cal. Date:	Due:
------	------------	------------	------

Method C (440 °C) or D (750 °C): Ash Content and Organic Matter Determination

Muffle Furnace: 440 °C		Tare #	
t	Tare Weight (Dish plus Aluminum Foil Cover)	grams	74.83
b	Mass of Oven Dry Specimen + Tare Wt.	grams	99.69
c	Ash Weight + Tare Wt.	grams	85.96
C	Ash Weight	c-t	11.13
B	Mass of Oven Dry Specimen	(b-t)	24.86
D	% Ash Content	(C/B)*100	44.8%
	% Organic Matter	100-D	55.2%

Muffle Furnace:	S&ME ID #:	Cal. Date:	Due:
-----------------	------------	------------	------

Notes / Deviations / References: ASTM D2974: Moisture, Ash, and Organic Matter of Peat and Other Organic Soils

B. Fuller, E.I.T.
Technician Name

7/27/2020
Date

On File
Signature

E.I.T.
Level/Certification

Robert A. Williamson, P.E.
Technical Responsibility

Signature

Senior Engineer
Position

7/28/2020
Date

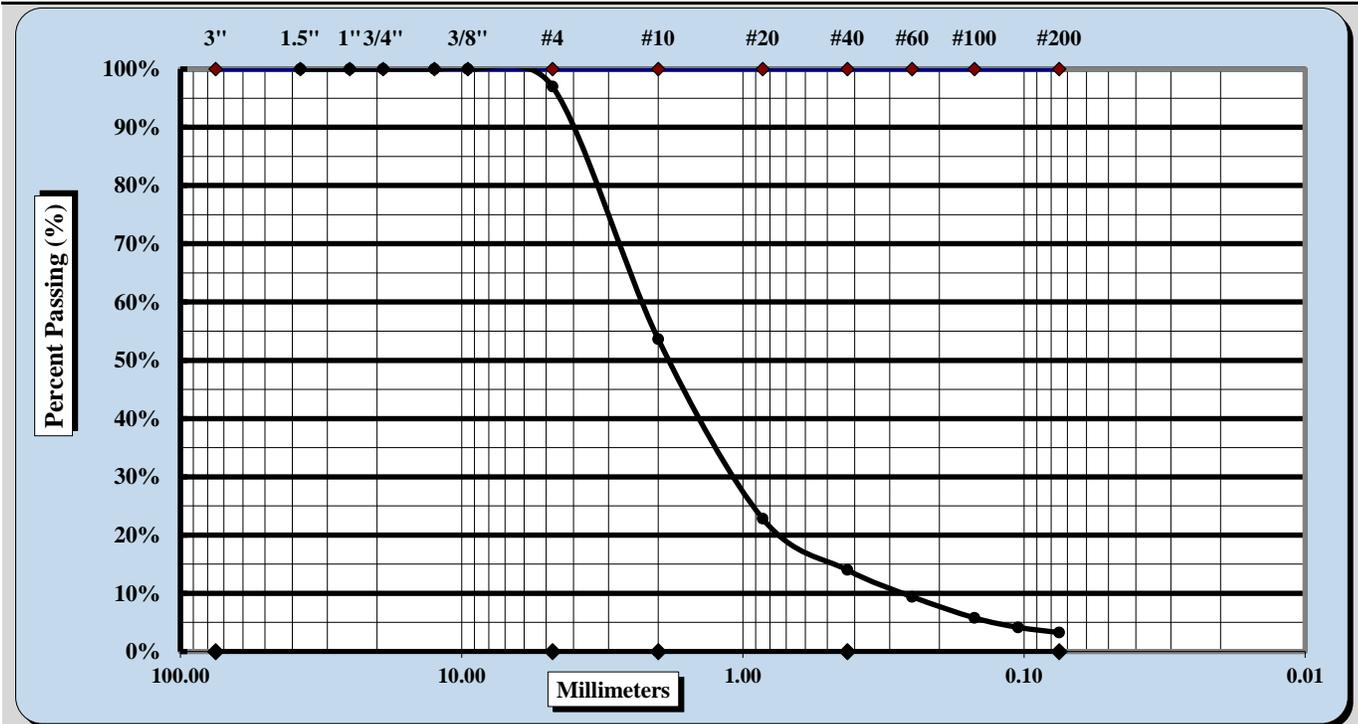
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ASTM D 422

S&ME, Inc. - Augusta: 1527 Crescent Drive, Augusta, GA 30909

Project #:	3319-20-027	Report Date:	7/28/20
Project Name:	Langley Pond Park Imporvements	Test Date(s):	7/17/2020 - 7/28/20
Client Name:	Alfred Benesch & Company		
Client Address:	1005 Broad Street, Augusta, GA 30901		
Boring:	B-5	Sample #:	2
Depth:	3.5'-5'	Sample Date:	6/26/2020
		Offset:	Elevation:
Sample Description: Gray, poorly graded SAND (SP)			



Cobbles	< 300 mm (12") and > 75 mm (3")	Fine Sand	< 0.425 mm and > 0.075 mm
Gravel	< 75 mm and > 4.75 mm (#4)	Silt	< 0.075 and > 0.005 mm
Coarse Sand	< 4.75 mm and > 2.00 mm (#10)	Clay	< 0.005 mm
Medium Sand	< 2.00 mm and > 0.425 mm (#40)	Colloids	< 0.001 mm

Maximum Particle Size	9.50 mm	Coarse Sand	30.8%	Fine Sand	6.2%
Gravel	46.3%	Medium Sand	13.4%	Silt & Clay	3.3%
Liquid Limit	NT	Plastic Limit	NT	Plastic Index	NT
Specific Gravity		Cc =	NA	Cu =	NA
				Moisture Content	14.7%
Coarse Sand	30.8%	Medium Sand	13.4%	Fine Sand	6.2%
Description of Sand & Gravel Particles:		Rounded	<input checked="" type="checkbox"/>	Angular	<input type="checkbox"/>
Hard & Durable	<input type="checkbox"/>	Soft	<input type="checkbox"/>	Weathered & Friable	<input checked="" type="checkbox"/>

Notes / Deviations / References:

Robert A. Williamson, P.E.
Technical Responsibility

[Signature]
Signature

Senior Engineer
Position

7/28/2020
Date

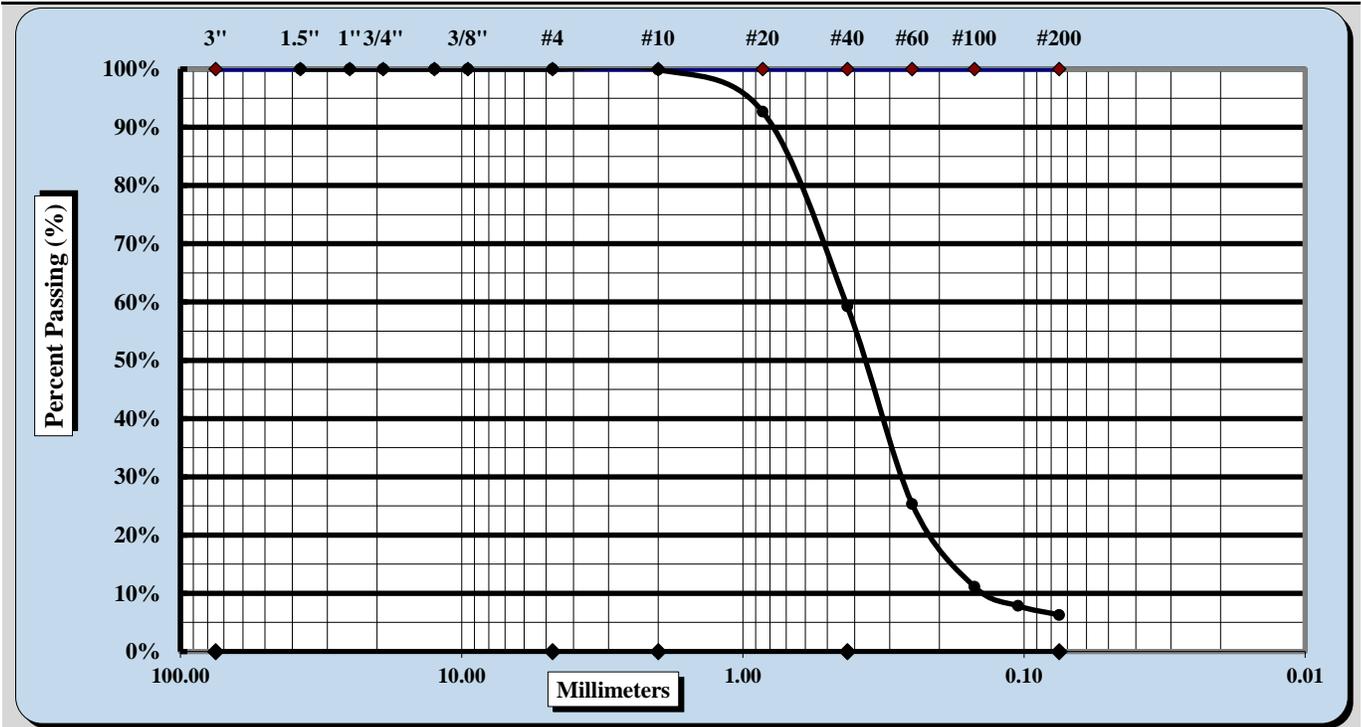
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ASTM D 422

S&ME, Inc. - Augusta: 1527 Crescent Drive, Augusta, GA 30909

Project #:	3319-20-027	Report Date:	7/28/20
Project Name:	Langley Pond Park Imporvements	Test Date(s):	7/17/2020 - 7/28/2020
Client Name:	Alfred Benesch & Company		
Client Address:	1005 Broad Street, Augusta, GA 30901		
Boring:	B-5	Sample #:	5
		Sample Date:	6/26/2020
Depth:	13.5'-15'	Offset:	Elevation:
Sample Description: White, poorly graded SAND with silt (SP-SM)			



Cobbles	< 300 mm (12") and > 75 mm (3")	Fine Sand	< 0.425 mm and > 0.075 mm
Gravel	< 75 mm and > 4.75 mm (#4)	Silt	< 0.075 and > 0.005 mm
Coarse Sand	< 4.75 mm and > 2.00 mm (#10)	Clay	< 0.005 mm
Medium Sand	< 2.00 mm and > 0.425 mm (#40)	Colloids	< 0.001 mm

Maximum Particle Size	4.75 mm	Coarse Sand	7.2%	Fine Sand	19.1%
Gravel	0.1%	Medium Sand	67.3%	Silt & Clay	6.3%
Liquid Limit	NT	Plastic Limit	NT	Plastic Index	NT
Specific Gravity		Cc = 1.1	Cu = 2.8	Moisture Content	21.1%
Coarse Sand	7.2%	Medium Sand	67.3%	Fine Sand	19.1%
Description of Sand & Gravel Particles:		Rounded	<input checked="" type="checkbox"/>	Angular	<input type="checkbox"/>
Hard & Durable	<input type="checkbox"/>	Soft	<input type="checkbox"/>	Weathered & Friable	<input checked="" type="checkbox"/>

Notes / Deviations / References:

<u>Robert A. Williamson, P.E.</u>		<u>Senior Engineer</u>	<u>7/28/2020</u>
Technical Responsibility	Signature	Position	Date

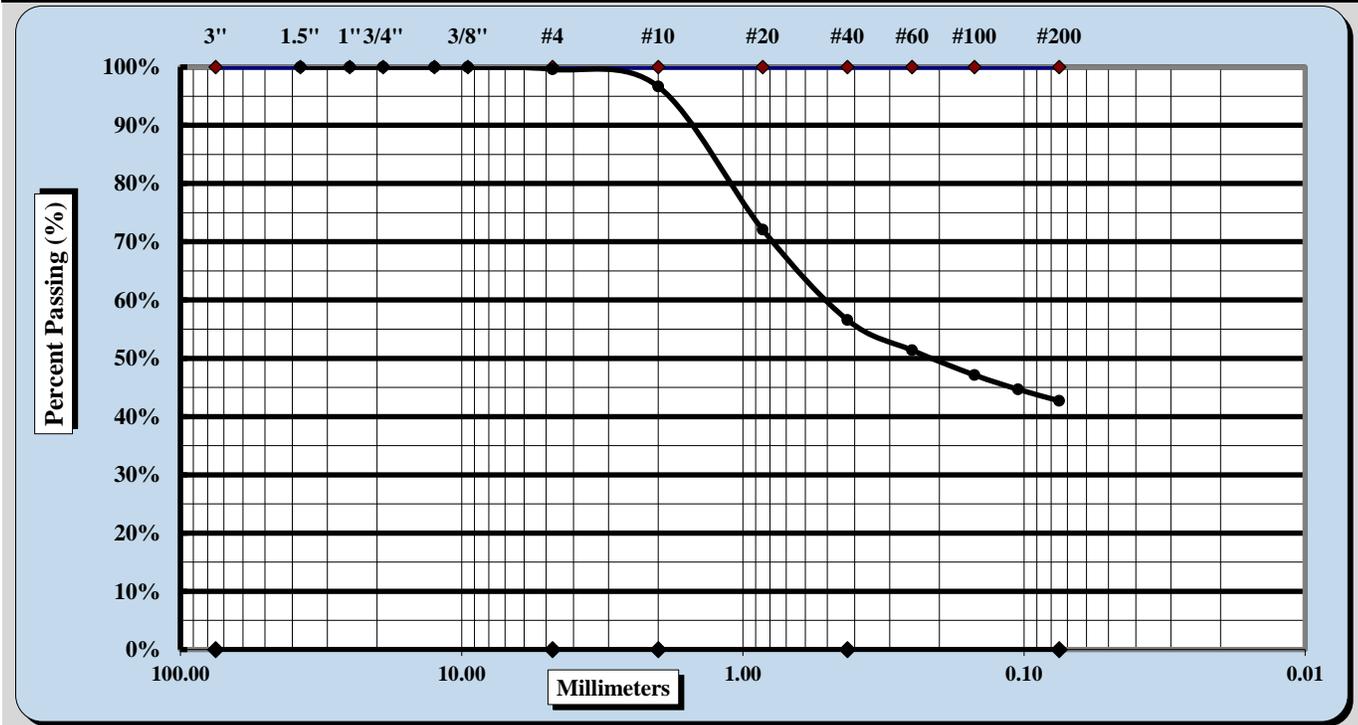
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ASTM D 422

S&ME, Inc. - Augusta: 1527 Crescent Drive, Augusta, GA 30909

Project #:	3319-20-027	Report Date:	7/28/20
Project Name:	Langley Pond Park Imporvements	Test Date(s):	7/17/20 - 7/28/20
Client Name:	Alfred Benesch & Company		
Client Address:	1005 Broad Street, Augusta, GA 30901		
Boring:	B-5	Sample #:	9
Depth:	33.5'-35'	Sample Date:	6/26/2020
		Offset:	Elevation:
Sample Description: White, silty SAND (SM)			



Cobbles	< 300 mm (12") and > 75 mm (3")	Fine Sand	< 0.425 mm and > 0.075 mm
Gravel	< 75 mm and > 4.75 mm (#4)	Silt	< 0.075 and > 0.005 mm
Coarse Sand	< 4.75 mm and > 2.00 mm (#10)	Clay	< 0.005 mm
Medium Sand	< 2.00 mm and > 0.425 mm (#40)	Colloids	< 0.001 mm

Maximum Particle Size	9.50 mm	Coarse Sand	24.6%	Fine Sand	8.7%
Gravel	3.3%	Medium Sand	20.7%	Silt & Clay	42.7%
Liquid Limit	NT	Plastic Limit	NT	Plastic Index	NT
Specific Gravity		Cc =	NA	Cu =	NA
				Moisture Content	20.5%
Coarse Sand	24.6%	Medium Sand	20.7%	Fine Sand	8.7%
Description of Sand & Gravel Particles:		Rounded	<input checked="" type="checkbox"/>	Angular	<input type="checkbox"/>
Hard & Durable	<input type="checkbox"/>	Soft	<input type="checkbox"/>	Weathered & Friable	<input checked="" type="checkbox"/>

Notes / Deviations / References:

<u>Robert A. Williamson, P.E.</u> Technical Responsibility	 Signature	Senior Engineer Position	7/28/2020 Date
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Appendix IV



**BUILT FOR
VERSATILITY**

Important Information About Your Geotechnical Engineering Report

Variations in subsurface conditions can be a principal cause of construction delays, cost overruns and claims. The following information is provided to assist you in understanding and managing the risk of these variations.

Geotechnical Findings Are Professional Opinions

Geotechnical engineers cannot specify material properties as other design engineers do. Geotechnical material properties have a far broader range on a given site than any manufactured construction material, and some geotechnical material properties may change over time because of exposure to air and water, or human activity.

Site exploration identifies subsurface conditions at the time of exploration and only at the points where subsurface tests are performed or samples obtained. Geotechnical engineers review field and laboratory data and then apply their judgment to render professional opinions about site subsurface conditions. Their recommendations rely upon these professional opinions. Variations in the vertical and lateral extent of subsurface materials may be encountered during construction that significantly impact construction schedules, methods and material volumes. While higher levels of subsurface exploration can mitigate the risk of encountering unanticipated subsurface conditions, no level of subsurface exploration can eliminate this risk.

Scope of Geotechnical Services

Professional geotechnical engineering judgment is required to develop a geotechnical exploration scope to obtain information necessary to support design and construction. A number of unique project factors are considered in developing the scope of geotechnical services, such as the exploration objective; the location, type, size and weight of the proposed structure; proposed site grades and improvements; the construction schedule and sequence; and the site geology.

Geotechnical engineers apply their experience with construction methods, subsurface conditions and exploration methods to develop the exploration scope. The scope of each exploration is unique based on available project and site information. Incomplete project information or constraints on the scope of exploration increases the risk of variations in subsurface conditions not being identified and addressed in the geotechnical report.

Services Are Performed for Specific Projects

Because the scope of each geotechnical exploration is unique, each geotechnical report is unique. Subsurface conditions are explored and recommendations are made for a specific project. Subsurface information and recommendations may not be adequate for other uses. Changes in a proposed structure location, foundation loads, grades, schedule, etc. may require additional geotechnical exploration, analyses, and consultation. The geotechnical engineer should be consulted to determine if additional services are required in response to changes in proposed construction, location, loads, grades, schedule, etc.

Geo-Environmental Issues

The equipment, techniques, and personnel used to perform a geo-environmental study differ significantly from those used for a geotechnical exploration. Indications of environmental contamination may be encountered incidental to performance of a geotechnical exploration but go unrecognized. Determination of the presence, type or extent of environmental contamination is beyond the scope of a geotechnical exploration.

Geotechnical Recommendations Are Not Final

Recommendations are developed based on the geotechnical engineer's understanding of the proposed construction and professional opinion of site subsurface conditions. Observations and tests must be performed during construction to confirm subsurface conditions exposed by construction excavations are consistent with those assumed in development of recommendations. It is advisable to retain the geotechnical engineer that performed the exploration and developed the geotechnical recommendations to conduct tests and observations during construction. This may reduce the risk that variations in subsurface conditions will not be addressed as recommended in the geotechnical report.

**SECTION 00 43 36
PROPOSED SUBCONTRACTORS FORM**

PART 1 - GENERAL

1.1 BID FOR AND TO

A. Project Name and Address

LANGLEY POND PARK – PHASE 1

B. Owner's Name and Address:

Aiken County Government
1930 University Parkway
Aiken, SC 29801
803-642-1535

1.1 BID FROM

Bidder: _____

Address: _____

1.2 SUBMISSION REQUIREMENTS

A. Submit this Form with Bid Form.

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Project #19020024

1.3 LIST OF PROPOSED SUBCONTRACTORS

A. The following work will be performed or provided by Subcontractors and coordinated by us.

WORK SUBJECT	SUBCONTRACTOR
1 _____	_____
2 _____	_____
3 _____	_____
4 _____	_____
5 _____	_____
6 _____	_____
7 _____	_____
8 _____	_____
9 _____	_____
10 _____	_____
11 _____	_____
12 _____	_____
13 _____	_____
14 _____	_____
15 _____	_____

Langley Pond Park - Specifications
Project #19020024

SUBMITTED ON: _____, 20_____

BY: _____

(Signature of person authorized to sign)

(Typed name and title of person authorized to sign)

(Firm or corporation)

(Address)

(City, state, postal code)

(Telephone number)

(Telecopier number)

(License Number, State, and Date of Expiration)

(Date)

(Seal)

ATTEST: _____

(Signature of person authorized to sign)

(Typed name and title of person authorized to sign)

(Date)

END OF SECTION 00 43 36

Langley Pond Park - Specifications
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ITEM #	WORK DESCRIPTION	VALUE
1	DEMOLITION - COMPLETE	\$
2	EARTHWORK - COMPLETE	\$
3	STORMWATER - MINUS DETENTION SYSTEM	\$
4	STORMWATER DETENTION SYSTEM - COMPLETE	\$
5	PAVING - HEAVY DUTY	\$
6	PAVING - REGULAR DUTY	\$
7	HARDSCAPE - SIDEWALKS, CURBS	\$
8	HARDSCAPE - CONCRETE TRAILS & PLAZA	\$
9	EROSION CONTROL EXCLUDING SOD - COMPLETE	\$
10	RETAINING WALLS - COMPLETE	\$
11	PAVEMENT MARKING & SIGNAGE	\$
12	STREET FURNITURE (BENCHES, TRASH, GRILLS) - COMPLETE	\$
13	MISTING STATION #1	\$
14	SHADE SAIL #1	\$
15	FLAGPOLES - COMPLETE FOR 3	\$
16	HANDRAILS	\$
17	FENCING - TYPE 1	\$
18	FENCING - TYPE 2	\$
19	WATER SERVICE - POTABLE	\$
20	LANDSCAPE - COMPLETE	\$
21	IRRIGATION - COMPLETE	\$
22	HAMMOCK PARK - COMPLETE	\$
23	WOOD PLATFORM - COMPLETE	\$
24	DRINKING FOUNTAIN - COMPLETE	\$
25	TRELLIS #1	\$
26	TILEWORK @ CONCESSIONS BUILDING	\$
27	ELECTRICAL & COMMUNICATION - COMPLETE	\$
28		\$
29		\$
30		\$

Langley Pond Park - Specifications
Project #19020024

SUBMITTED ON: _____, 20_____

BY: _____

(Signature of person authorized to sign)

(Typed name and title of person authorized to sign)

(Firm or corporation)

(Address)

(City, state, postal code)

(Telephone number)

(Telecopier number)

(License Number, State, and Date of Expiration)

(Date)

(Seal)

ATTEST: _____

(Signature of person authorized to sign)

(Typed name and title of person authorized to sign)

(Date)

END OF SECTION 00 43 73

Langley Pond Park - Specifications
Project #19020024

SECTION 011000 - SUMMARY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes:

1. Project information.
2. Work covered by Contract Documents.
3. Access to site.
4. Coordination with occupants.
5. Work restrictions.
6. Specification and drawing conventions.

- B. Related Section:

1. Division 01 Section "Temporary Facilities and Controls" for limitations and procedures governing temporary use of Owner's facilities.

1.3 PROJECT INFORMATION

- A. Project Identification:

LANGLEY POND PARK, PHASE 1
113 Langley Dam Road, Warrenton, South Carolina.
Refer to drawings for detailed location.

- B. Owner: Aiken County Government, Aiken South Carolina
Owner's Representative: Teresa Crain, PE – County Engineer 803-642-1535

- C. Architect (Engineer): Alfred E. Benesch – 706-722-4114 (Charles Hall) 1005 Broad Street,
Suite 200, Augusta, Ga 30901 – chall@benesch.com

Langley Pond Park - Specifications
Project #19020024

1.4 WORK COVERED BY CONTRACT DOCUMENTS

- A. The Work of the Project is defined by the Contract Documents.

ADDITIVE (ADD) ALTERNATES: Per section 012300 - ALTERNATES

DEDUCTIVE ALTERNATES: Per section 012300 - ALTERNATES

- B. Type of Contract

1. Project will be constructed under a single prime contract.

1.5 ACCESS TO SITE

- A. General: Contractor shall have limited use of Project site for construction operations as indicated on Drawings by the Contract limits and as indicated by requirements of this Section.

- B. Use of Site: Limit use of Project site to areas within the Contract limits indicated. Do not disturb portions of Project site beyond areas in which the Work is indicated.

1. Limits: Confine construction operations to the area noted as "Construction Limits" on the construction drawings. Generally, this area encompasses the footprint of the new park, the adjoining Greenway, and a portion of the existing adjacent Center Street. Additional limits can be discussed with the owner but must be signed off on in writing.
2. Site Access: Construction access to the site shall be from Langley Dam Service Drive near the intersection with Langley Dam Road. All damage to county infrastructure will be repaired at the contractor's expense.
3. Parking: Construction parking within the project limits. No construction parking will be allowed along Langley Dam Road or Langley Dam Access Road. The contractor is encouraged to centralize all parking for workers and visitors.

1.6 COORDINATION WITH OCCUPANTS

- A. Full Owner Occupancy: Owner will occupy adjacent site and existing adjacent building(s) during entire construction period. Cooperate with Owner during construction operations to minimize conflicts and facilitate Owner usage. Perform the Work so as not to interfere with Owner's day-to-day operations. Maintain existing exits unless otherwise indicated. Site provides for access to the County Maintenance Shed, disc golf course north of the site and related activities.

1. Maintain access to existing walkways, corridors, and other adjacent occupied or used facilities. Do not close or obstruct walkways, corridors, or other occupied or used

Langley Pond Park - Specifications
Project #19020024

- facilities without written permission from Owner and approval of authorities having jurisdiction.
2. Notify the Owner not less than 72 hours in advance of activities that will affect Owner's operations, including access and public use.
- B. Owner Limited Occupancy of Completed Areas of Construction: Owner reserves the right to occupy and to place and install equipment in completed portions of the Work, prior to Substantial Completion of the entire Work, provided such occupancy does not interfere with completion of the Work. Such placement of equipment and limited occupancy shall not constitute acceptance of the total Work.
1. Engineer will prepare a Certificate of Substantial Completion for each specific portion of the Work to be occupied prior to Owner acceptance of the completed Work.
 2. Obtain a Certificate of Occupancy from authorities having jurisdiction before limited Owner occupancy.
 3. On occupancy, Owner will assume responsibility for maintenance and custodial service for occupied portions of Work.

1.7 WORK RESTRICTIONS

- A. Work Restrictions, General: Comply with restrictions on construction operations.
1. Comply with limitations on use of public streets and other requirements of authorities having jurisdiction.
- B. On-Site Work Hours: Limit work in the existing building to normal business working hours of 6:00 a.m. to 8:00 p.m., Monday through Saturday, except as otherwise indicated.
1. Sunday Hours: Only with prior approval of the Owner.
 2. Hours for Utility Shutdowns: With 72-hour notice and approval from the Owner and Utility Owner(s).
- C. Existing Utility Interruptions: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after providing temporary utility services according to requirements indicated:
1. Notify Architect and Owner not less than two days in advance of proposed utility interruptions.
 2. Obtain Owner's written permission before proceeding with utility interruptions.
- D. Noise, Vibration, and Odors: Coordinate operations that may result in high levels of noise and vibration, odors, or other disruption to Owner occupancy with Owner.
- E. Nonsmoking Building: Smoking is not permitted within the limits of Riverside Village / Project Area.
- F. Controlled Substances: Use of tobacco products and other controlled substances is not permitted.

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Project #19020024

G. Employee Screening: Comply with Owner's requirements regarding drug and background screening of Contractor personnel working on the Project site.

1. Maintain list of approved screened personnel with Owner's Representative.

1.8 SPECIFICATION AND DRAWING CONVENTIONS

A. Specification Content: The Specifications use certain conventions for the style of language and the intended meaning of certain terms, words, and phrases when used in particular situations. These conventions are as follows:

1. Imperative mood and streamlined language are generally used in the Specifications. The words "shall," "shall be," or "shall comply with," depending on the context, are implied where a colon (:) is used within a sentence or phrase.
2. Specification requirements are to be performed by Contractor unless specifically stated otherwise.

B. Division 01 General Requirements: Requirements of Sections in Division 01 apply to the Work of all Sections in the Specifications.

C. Drawing Coordination: Requirements for materials and products identified on the Drawings are described in detail in the Specifications. One or more of the following are used on the Drawings to identify materials and products:

1. Terminology: Materials and products are identified by the typical generic terms used in the individual Specifications Sections.
2. Abbreviations: Materials and products are identified by abbreviations published as part of the U.S. National CAD Standard and scheduled on Drawings.
3. Keynoting: Materials and products are identified by reference keynotes referencing Specification Section numbers found in this Project Manual.

1.9 MISCELLANEOUS PROVISIONS

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 011000

Langley Pond Park - Specifications
Project #19020024

SECTION 012300 - ALTERNATES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes administrative and procedural requirements for alternates.

1.3 DEFINITIONS

- A. Alternate: An amount proposed by bidders and stated on the Bid Form for certain work defined in the Bidding Requirements that may be added to or deducted from the base bid amount if Owner decides to accept a corresponding change either in the amount of construction to be completed or in the products, materials, equipment, systems, or installation methods described in the Contract Documents.
 - 1. Alternates described in this Section are part of the Work only if enumerated in the Agreement.
 - 2. The cost or credit for each alternate is the net addition to or deduction from the Contract Sum to incorporate alternate into the Work. No other adjustments are made to the Contract Sum.

1.4 PROCEDURES

- A. Coordination: Modify or adjust affected adjacent work as necessary to completely integrate work of the alternate into Project.
 - 1. Include as part of each alternate, miscellaneous devices, accessory objects, and similar items incidental to or required for a complete installation whether or not indicated as part of alternate.
- B. Notification: Immediately following award of the Contract, notify each party involved, in writing, of the status of each alternate. Indicate if alternates have been accepted, rejected, or deferred for later consideration. Include a complete description of negotiated modifications to alternates.
- C. Execute accepted alternates under the same conditions as other work of the Contract.

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Project #19020024

- D. Schedule: A schedule of alternates is included at the end of this Section. Specification Sections referenced in schedule contain requirements for materials necessary to achieve the work described under each alternate.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 SCHEDULE OF ALTERNATES

END OF SECTION 012300

SECTION 01 25 00 - SUBSTITUTION PROCEDURES

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Quality assurance.
- B. Product options.
- C. Product substitution procedures.

1.2 QUALITY ASSURANCE

- A. Contract is based on products and standards established in Contract Documents without consideration of proposed substitutions.
- B. Products specified define standard of quality, type, function, dimension, appearance, and performance required.
- C. Substitution Proposals: Permitted for specified products except where specified otherwise. Do not substitute products unless substitution has been accepted and approved in writing by Owner.

1.3 PRODUCT OPTIONS

- A. See Section 01 60 00 - Product Requirements

1.4 PRODUCT SUBSTITUTION PROCEDURES

- A. Architect/Engineer will consider requests for substitutions only within [15] <fifteen> days after date of Owner-Contractor Agreement.
- B. Substitutions may be considered when a product becomes unavailable through no fault of Contractor.
- C. Document each request with complete data, substantiating compliance of proposed substitution with Contract Documents, including:
 - 1. Manufacturer's name and address, product, trade name, model, or catalog number, performance and test data, and reference standards.
 - 2. Itemized point-by-point comparison of proposed substitution with specified product, listing variations in quality, performance, and other pertinent characteristics.
 - 3. Reference to Article and Paragraph numbers in Specification Section.
 - 4. Cost data comparing proposed substitution with specified product and amount of net change to Contract Sum.
 - 5. Changes required in other Work.
 - 6. Availability of maintenance service and source of replacement parts as applicable.
 - 7. Certified test data to show compliance with performance characteristics specified.
 - 8. Samples when applicable or requested.

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9. Other information as necessary to assist Architect/Engineer's evaluation.
- D. A request constitutes a representation that Bidder:
1. Has investigated proposed product and determined that it meets or exceeds quality level of specified product.
 2. Will provide same warranty for substitution as for specified product.
 3. Will coordinate installation and make changes to other Work that may be required for the Work to be complete with no additional cost to Owner.
 4. Waives claims for additional costs or time extension that may subsequently become apparent.
 5. Will coordinate installation of the accepted substitute, making such changes as may be required for the Work to be complete in all respects.
 6. Will reimburse Owner [and Architect/Engineer] for review or redesign services associated with reapproval by authorities having jurisdiction.
- E. Substitutions will not be considered when they are indicated or implied on Shop Drawing or Product Data submittals without separate written request or when acceptance will require revision to Contract Documents.
- F. Substitution Submittal Procedure:
1. Submit requests for substitutions on CSI Form 13.1A Substitution Request-After the Bidding/Negotiating Stage.
 2. Submit electronic files to Project website of Request for Substitution for consideration. Limit each request to one proposed substitution.
 3. Submit Shop Drawings, Product Data, and certified test results attesting to proposed product equivalence. Burden of proof is on proposer.
 4. Architect/Engineer will notify Contractor in writing of decision to accept or reject request.
- 1.5 INSTALLER SUBSTITUTION PROCEDURES
- A. Architect/Engineer will consider requests for substitutions only within 15 <fifteen> days after date of Owner-Contractor Agreement.
- B. Document each request with:
1. Installer's qualifications.
 2. Installer's experience in work similar to that specified.
 3. Other information as necessary to assist Architect/Engineer's evaluation.
- C. Substitution Submittal Procedure:
1. Submit electronic files to Project website of Request for Substitution for consideration. Limit each request to one proposed substitution.
 2. Architect/Engineer will notify Contractor in writing of decision to accept or reject request.

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PART 2 PRODUCTS - Not Used

PART 3 EXECUTION - Not Used

END OF SECTION

Langley Pond Park - Specifications
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SECTION 012600 - CONTRACT MODIFICATION PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes administrative and procedural requirements for handling and processing Contract modifications.
- B. Related Sections:
 - 1. Division 01 Section "Product Requirements" for administrative procedures for handling requests for substitutions made after Contract award.

1.3 MINOR CHANGES IN THE WORK

- A. Architect will issue supplemental instructions authorizing minor changes in the Work, not involving adjustment to the Contract Sum or the Contract Time, on AIA Document G710, "Architect's Supplemental Instructions."

1.4 PROPOSAL REQUESTS

- A. Owner-Initiated Proposal Requests: Architect will issue a detailed description of proposed changes in the Work that may require adjustment to the Contract Sum or the Contract Time. If necessary, the description will include supplemental or revised Drawings and Specifications.
 - 1. Proposal Requests issued by Architect are not instructions either to stop work in progress or to execute the proposed change.
 - 2. Within 5 business days after receipt of Proposal Request, submit a quotation estimating cost adjustments to the Contract Sum and the Contract Time necessary to execute the change.
 - a. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
 - b. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
 - c. Include costs of labor and supervision directly attributable to the change.

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- d. Include an updated Contractor's construction schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.
 - e. Quotation Form: Use forms acceptable to Architect.
- B. Contractor-Initiated Proposals: If latent or changed conditions require modifications to the Contract, Contractor may initiate a claim by submitting a request for a change to Architect.
- 1. Include a statement outlining reasons for the change and the effect of the change on the Work. Provide a complete description of the proposed change. Indicate the effect of the proposed change on the Contract Sum and the Contract Time.
 - 2. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
 - 3. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
 - 4. Include costs of labor and supervision directly attributable to the change.
 - 5. Include an updated Contractor's construction schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.
 - 6. Comply with requirements in Division 01 Section "Substitution Procedures" if the proposed change requires substitution of one product or system for product or system specified.
 - 7. Proposal Request Form: Use form acceptable to Architect.

1.5 CHANGE ORDER PROCEDURES

- A. On Owner's approval of a Proposal Request, Architect will issue a Change Order for signatures of Owner and Contractor on AIA Document G701.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 012600

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SECTION 012900 - PAYMENT PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section specifies administrative and procedural requirements necessary to prepare and process Applications for Payment.
- B. Related Sections:
 - 1. Division 01 Section "Contract Modification Procedures" for administrative procedures for handling changes to the Contract.
 - 2. Division 01 Section "Construction Progress Documentation" for administrative requirements governing the preparation and submittal of the Contractor's construction schedule.
 - 3. Division 01 Section "Submittal Procedures" for administrative requirements governing the preparation and submittal of the submittal schedule.

1.3 DEFINITIONS

- A. Schedule of Values: A statement furnished by Contractor allocating portions of the Contract Sum to various portions of the Work and used as the basis for reviewing Contractor's Applications for Payment.

1.4 SCHEDULE OF VALUES

- A. Coordination: Coordinate preparation of the schedule of values with preparation of Contractor's construction schedule.
 - 1. Correlate line items in the schedule of values with other required administrative forms and schedules, including the following:
 - a. Application for Payment forms with continuation sheets.
 - b. Submittal schedule.
 - c. Items required to be indicated as separate activities in Contractor's construction schedule.

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Project #19020024

2. Submit the schedule of values to Architect at earliest possible date but no later than **seven** days before the date scheduled for submittal of initial Applications for Payment.
 3. Subschedules for Separate Elements of Work: Where the Contractor's construction schedule defines separate elements of the Work, provide subschedules showing values correlated with each element.
- B. Format and Content: Use the Project Manual table of contents as a guide to establish line items for the schedule of values. Provide at least one line item for each Specification Section.
1. Identification: Include the following Project identification on the schedule of values:
 - a. Project name and location.
 - b. Name of Architect.
 - c. Architect's project number.
 - d. Contractor's name and address.
 - e. Date of submittal.
 2. Arrange schedule of values consistent with format of AIA Document G703.
 3. Arrange the schedule of values in tabular form with separate columns to indicate the following for each item listed:
 - a. Related Specification Section or Division.
 - b. Description of the Work.
 - c. Name of subcontractor.
 - d. Name of manufacturer or fabricator.
 - e. Name of supplier.
 - f. Change Orders (numbers) that affect value.
 - g. Dollar value of the following, as a percentage of the Contract Sum to nearest one-hundredth percent, adjusted to total 100 percent.
 - 1) Labor.
 - 2) Materials.
 - 3) Equipment.
 4. Provide a breakdown of the Contract Sum in enough detail to facilitate continued evaluation of Applications for Payment and progress reports. Coordinate with the Project Manual table of contents. Provide multiple line items for principal subcontract amounts in excess of **five** percent of Contract Sum.
 5. Round amounts to nearest whole dollar; total shall equal the Contract Sum.
 6. Provide a separate line item in the schedule of values for each part of the Work where Applications for Payment may include materials or equipment purchased or fabricated and stored, but not yet installed.
 - a. Differentiate between items stored on-site and items stored off-site. If required, include evidence of insurance.
 7. Each item in the schedule of values and Applications for Payment shall be complete. Include total cost and proportionate share of general overhead and profit for each item.

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Project #19020024

- a. Temporary facilities and other major cost items that are not direct cost of actual work-in-place may be shown either as separate line items in the schedule of values or distributed as general overhead expense, at Contractor's option.
8. Schedule Updating: Update and resubmit the schedule of values before the next Applications for Payment when Change Orders or Construction Change Directives result in a change in the Contract Sum.

1.5 APPLICATIONS FOR PAYMENT

- A. Each Application for Payment shall be consistent with previous applications and payments as certified by Architect and paid for by Owner.
 1. Initial Application for Payment, Application for Payment at time of Substantial Completion, and final Application for Payment involve additional requirements.
- B. Payment Application Times: The date for each progress payment is indicated in the Agreement between Owner and Contractor. The period of construction work covered by each Application for Payment is the period indicated in the Agreement.
- C. Payment Application Times: Progress payments shall be submitted to Architect by the **26 day** of the month. The period covered by each Application for Payment is one month, ending on the **last day of the month**.
 1. Submit draft copy of Application for Payment seven days prior to due date for review by Architect.
- D. Application for Payment Forms: Use AIA Document G702 and AIA Document G703.
- E. Application Preparation: Complete every entry on form. Notarize and execute by a person authorized to sign legal documents on behalf of Contractor. Architect will return incomplete applications without action.
 1. Entries shall match data on the schedule of values and Contractor's construction schedule. Use updated schedules if revisions were made.
 2. Include amounts for work completed following previous Application for Payment, whether or not payment has been received. Include only amounts for work completed at time of Application for Payment.
 3. Include amounts of Change Orders and Construction Change Directives issued before last day of construction period covered by application.
 4. Indicate separate amounts for work being carried out under Owner-requested project acceleration.
- F. Stored Materials: Include in Application for Payment amounts applied for materials or equipment purchased or fabricated and stored, but not yet installed. Differentiate between items stored on-site and items stored off-site.

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1. Provide certificate of insurance, evidence of transfer of title to Owner, and consent of surety to payment, for stored materials.
 2. Provide supporting documentation that verifies amount requested, such as paid invoices. Match amount requested with amounts indicated on documentation; do not include overhead and profit on stored materials.
 3. Provide summary documentation for stored materials indicating the following:
 - a. Materials previously stored and included in previous Applications for Payment.
 - b. Work completed for this Application utilizing previously stored materials.
 - c. Additional materials stored with this Application.
 - d. Total materials remaining stored, including materials with this Application.
- G. Transmittal: Submit three signed and notarized original copies of each Application for Payment to Architect by a method ensuring receipt within 24 hours. One copy shall include waivers of lien and similar attachments if required.
1. Transmit each copy with a transmittal form listing attachments and recording appropriate information about application.
- H. Waivers of Mechanic's Lien: With each Application for Payment, submit waivers of mechanic's liens from subcontractors, sub-subcontractors, and suppliers for construction period covered by the previous application.
1. Submit partial waivers on each item for amount requested in previous application, after deduction for retainage, on each item.
 2. When an application shows completion of an item, submit conditional final or full waivers.
 3. Owner reserves the right to designate which entities involved in the Work must submit waivers.
 4. Submit final Application for Payment with or preceded by conditional final waivers from every entity involved with performance of the Work covered by the application who is lawfully entitled to a lien.
 5. Waiver Forms: Submit waivers of lien on forms, executed in a manner acceptable to Owner.
- I. Initial Application for Payment: Administrative actions and submittals that must precede or coincide with submittal of first Application for Payment include the following:
1. List of subcontractors.
 2. Schedule of values.
 3. Contractor's construction schedule (preliminary if not final).
 4. Combined Contractor's construction schedule (preliminary if not final) incorporating Work of multiple contracts, with indication of acceptance of schedule by each Contractor.
 5. Products list (preliminary if not final).
 6. Schedule of unit prices.
 7. Submittal schedule (preliminary if not final).
 8. Copies of building permits.
 9. Certificates of insurance and insurance policies.
 10. Performance and payment bonds.

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11. Data needed to acquire Owner's insurance.
- J. Application for Payment at Substantial Completion: After issuing the Certificate of Substantial Completion, submit an Application for Payment showing 100 percent completion for portion of the Work claimed as substantially complete.
1. Include documentation supporting claim that the Work is substantially complete and a statement showing an accounting of changes to the Contract Sum.
 2. This application shall reflect Certificates of Partial Substantial Completion issued previously for Owner occupancy of designated portions of the Work.
- K. Final Payment Application: Submit final Application for Payment with releases and supporting documentation not previously submitted and accepted, including, but not limited, to the following:
1. Evidence of completion of Project closeout requirements.
 2. Insurance certificates for products and completed operations where required and proof that taxes, fees, and similar obligations were paid.
 3. Updated final statement, accounting for final changes to the Contract Sum.
 4. AIA Document G706, "Contractor's Affidavit of Payment of Debts and Claims."
 5. AIA Document G706A, "Contractor's Affidavit of Release of Liens."
 6. AIA Document G707, "Consent of Surety to Final Payment."

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 012900

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SECTION 013100 - PROJECT MANAGEMENT AND COORDINATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes administrative provisions for coordinating construction operations on Project including, but not limited to, the following:
 - 1. General project coordination procedures.
 - 2. Administrative and supervisory personnel.
 - 3. Requests for Information (RFIs).
 - 4. Project meetings.
- B. Each contractor shall participate in coordination requirements. Certain areas of responsibility are assigned to a specific contractor.
- C. Related Sections:
 - 1. Division 01 Section "Construction Progress Documentation" for preparing and submitting Contractor's construction schedule.
 - 2. Division 01 Section "Execution" for procedures for coordinating general installation and field-engineering services, including establishment of benchmarks and control points.
 - 3. Division 01 Section "Closeout Procedures" for coordinating closeout of the Contract.

1.3 DEFINITIONS

- A. RFI: Request from Owner, Architect, or Contractor seeking information from each other during construction.

1.4 COORDINATION

- A. Coordination: Coordinate construction operations included in different Sections of the Specifications to ensure efficient and orderly installation of each part of the Work. Coordinate construction operations, included in different Sections, that depend on each other for proper installation, connection, and operation.

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1. Schedule construction operations in sequence required to obtain the best results where installation of one part of the Work depends on installation of other components, before or after its own installation.
 2. Coordinate installation of different components to ensure maximum performance and accessibility for required maintenance, service, and repair.
 3. Make adequate provisions to accommodate items scheduled for later installation.
- B. Prepare memoranda for distribution to each party involved, outlining special procedures required for coordination. Include such items as required notices, reports, and list of attendees at meetings.
1. Prepare similar memoranda for Owner and separate contractors if coordination of their Work is required.
- C. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities and activities of other contractors to avoid conflicts and to ensure orderly progress of the Work. Such administrative activities include, but are not limited to, the following:
1. Preparation of Contractor's construction schedule.
 2. Preparation of the schedule of values.
 3. Installation and removal of temporary facilities and controls.
 4. Delivery and processing of submittals.
 5. Progress meetings.
 6. Preinstallation conferences.
 7. Project closeout activities.
 8. Startup and adjustment of systems.
 9. Project closeout activities.
- D. Conservation: Coordinate construction activities to ensure that operations are carried out with consideration given to conservation of energy, water, and materials. Coordinate use of temporary utilities to minimize waste.
1. Salvage materials and equipment involved in performance of, but not actually incorporated into, the Work. Refer to other Sections for disposition of salvaged materials that are designated as Owner's property.
- 1.5 KEY PERSONNEL
- A. Key Personnel Names: Within 15 days of starting construction operations, submit a list of key personnel assignments, including superintendent and other personnel in attendance at Project site. Identify individuals and their duties and responsibilities; list addresses and telephone numbers, including home, office, and cellular telephone numbers and email addresses. Provide names, addresses, and telephone numbers of individuals assigned as standbys in the absence of individuals assigned to Project.
1. Post copies of list in project meeting room, in temporary field office, and by each temporary telephone. Keep list current at all times.

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1.6 REQUESTS FOR INFORMATION (RFIs)

- A. General: Immediately on discovery of the need for additional information or interpretation of the Contract Documents, Contractor shall prepare and submit an RFI in the form specified.
1. Architect will return RFIs submitted to Architect by other entities controlled by Contractor with no response.
 2. Coordinate and submit RFIs in a prompt manner so as to avoid delays in Contractor's work or work of subcontractors.
- B. Content of the RFI: Include a detailed, legible description of item needing information or interpretation and the following:
1. Project name.
 2. Project number.
 3. Date.
 4. Name of Contractor.
 5. Name of Architect.
 6. RFI number, numbered sequentially.
 7. RFI subject.
 8. Specification Section number and title and related paragraphs, as appropriate.
 9. Drawing number and detail references, as appropriate.
 10. Field dimensions and conditions, as appropriate.
 11. Contractor's suggested resolution. If Contractor's solution(s) impacts the Contract Time or the Contract Sum, Contractor shall state impact in the RFI.
 12. Contractor's signature.
 13. Attachments: Include sketches, descriptions, measurements, photos, Product Data, Shop Drawings, coordination drawings, and other information necessary to fully describe items needing interpretation.
 - a. Include dimensions, thicknesses, structural grid references, and details of affected materials, assemblies, and attachments on attached sketches.
- C. RFI Forms: Software-generated form with substantially the same content as indicated above, acceptable to Architect.
- D. Architect's Action: Architect will review each RFI, determine action required, and respond. Allow 10 working days for Architect's response for each RFI. RFIs received by Architect after 1:00 p.m. will be considered as received the following working day.
1. The following RFIs will be returned without action:
 - a. Requests for approval of submittals.
 - b. Requests for approval of substitutions.
 - c. Requests for coordination information already indicated in the Contract Documents.
 - d. Requests for adjustments in the Contract Time or the Contract Sum.
 - e. Requests for interpretation of Architect's actions on submittals.
 - f. Incomplete RFIs or inaccurately prepared RFIs.

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2. Architect's action may include a request for additional information, in which case Architect's time for response will date from time of receipt of additional information.
 3. Architect's action on RFIs that may result in a change to the Contract Time or the Contract Sum may be eligible for Contractor to submit Change Proposal according to Division 01 Section "Contract Modification Procedures."
 - a. If Contractor believes the RFI response warrants change in the Contract Time or the Contract Sum, notify Architect in writing within 5 working days of receipt of the RFI response.
- E. On receipt of Architect's action, update the RFI log and immediately distribute the RFI response to affected parties. Review response and notify Architect within 5 working days if Contractor disagrees with response.
- F. RFI Log: Prepare, maintain, and submit a tabular log of RFIs organized by the RFI number. Submit log weekly. Include the following:
1. Project name.
 2. Name and address of Contractor.
 3. Name and address of Architect.
 4. RFI number including RFIs that were dropped and not submitted.
 5. RFI description.
 6. Date the RFI was submitted.
 7. Date Architect's response was received.

1.7 PROJECT MEETINGS

- A. General: Schedule and conduct meetings and conferences at Project site, unless otherwise indicated.
1. Attendees: Inform participants and others involved, and individuals whose presence is required, of date and time of each meeting. Notify Owner and Architect of scheduled meeting dates and times.
 2. Agenda: Prepare the meeting agenda. Distribute the agenda to all invited attendees.
 3. Minutes: Entity responsible for conducting meeting will record significant discussions and agreements achieved. Distribute the meeting minutes to everyone concerned, including Owner, and Architect, within three days of the meeting.
- B. Preconstruction Conference: Architect will schedule and conduct a preconstruction conference before starting construction, at a time convenient to Owner and Architect, but no later than 15 days after execution of the Agreement.
1. Conduct the conference to review responsibilities and personnel assignments.
 2. Attendees: Authorized representatives of Owner, Architect, and their consultants; Contractor and its superintendent; major subcontractors; suppliers; and other concerned parties shall attend the conference. Participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.

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3. Agenda: Discuss items of significance that could affect progress, including the following:
 - a. Tentative construction schedule.
 - b. Phasing.
 - c. Critical work sequencing and long-lead items.
 - d. Designation of key personnel and their duties.
 - e. Lines of communications.
 - f. Procedures for processing field decisions and Change Orders.
 - g. Procedures for RFIs.
 - h. Procedures for testing and inspecting.
 - i. Procedures for processing Applications for Payment.
 - j. Distribution of the Contract Documents.
 - k. Submittal procedures.
 - l. Sustainable design requirements.
 - m. Preparation of record documents.
 - n. Use of the premises and existing building.
 - o. Work restrictions.
 - p. Working hours.
 - q. Owner's occupancy requirements.
 - r. Responsibility for temporary facilities and controls.
 - s. Procedures for moisture and mold control.
 - t. Procedures for disruptions and shutdowns.
 - u. Construction waste management and recycling.
 - v. Parking availability.
 - w. Office, work, and storage areas.
 - x. Equipment deliveries and priorities.
 - y. First aid.
 - z. Security.
 - aa. Progress cleaning.
 4. Minutes: Entity responsible for conducting meeting will record and distribute meeting minutes.
- C. Preinstallation Conferences: Conduct a preinstallation conference at Project site before each construction activity that requires coordination with other construction.
1. Attendees: Installer and representatives of manufacturers and fabricators involved in or affected by the installation and its coordination or integration with other materials and installations that have preceded or will follow, shall attend the meeting. Advise Architect, of scheduled meeting dates.
 2. Agenda: Review progress of other construction activities and preparations for the particular activity under consideration, including requirements for the following:
 - a. Contract Documents.
 - b. Options.
 - c. Related RFIs.
 - d. Related Change Orders.
 - e. Purchases.

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- f. Deliveries.
 - g. Submittals.
 - h. Review of mockups.
 - i. Possible conflicts.
 - j. Compatibility problems.
 - k. Time schedules.
 - l. Weather limitations.
 - m. Manufacturer's written recommendations.
 - n. Warranty requirements.
 - o. Compatibility of materials.
 - p. Acceptability of substrates.
 - q. Temporary facilities and controls.
 - r. Space and access limitations.
 - s. Regulations of authorities having jurisdiction.
 - t. Testing and inspecting requirements.
 - u. Installation procedures.
 - v. Coordination with other work.
 - w. Required performance results.
 - x. Protection of adjacent work.
 - y. Protection of construction and personnel.
- 3. Record significant conference discussions, agreements, and disagreements, including required corrective measures and actions.
 - 4. Reporting: Distribute minutes of the meeting to each party present and to other parties requiring information.
 - 5. Do not proceed with installation if the conference cannot be successfully concluded. Initiate whatever actions are necessary to resolve impediments to performance of the Work and reconvene the conference at earliest feasible date.
- D. Project Closeout Conference: A Project closeout conference, at a time convenient to Owner and Architect, but no later than **90** days prior to the scheduled date of Substantial Completion.
- 1. Conduct the conference to review requirements and responsibilities related to Project closeout.
 - 2. Attendees: Authorized representatives of Owner, Architect, and their consultants; Contractor and its superintendent; major subcontractors; suppliers; and other concerned parties shall attend the meeting. Participants at the meeting shall be familiar with Project and authorized to conclude matters relating to the Work.
 - 3. Agenda: Discuss items of significance that could affect or delay Project closeout, including the following:
 - a. Preparation of record documents.
 - b. Procedures required prior to inspection for Substantial Completion and for final inspection for acceptance.
 - c. Submittal of written warranties.
 - d. Requirements for preparing sustainable design documentation.
 - e. Requirements for preparing operations and maintenance data.
 - f. Requirements for demonstration and training.

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- g. Preparation of Contractor's punch list.
 - h. Procedures for processing Applications for Payment at Substantial Completion and for final payment.
 - i. Submittal procedures.
 - j. Coordination of separate contracts.
 - k. Owner's partial occupancy requirements.
 - l. Installation of Owner's furniture, fixtures, and equipment.
 - m. Responsibility for removing temporary facilities and controls.
4. Minutes: Entity conducting meeting will record and distribute meeting minutes.
- E. Progress Meetings: Conduct progress meetings at biweekly intervals.
- 1. Coordinate dates of meetings with preparation of payment requests.
 - 2. Attendees: In addition to representatives of Owner, and Architect, each contractor, subcontractor, supplier, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the meeting shall be familiar with Project and authorized to conclude matters relating to the Work.
 - 3. Agenda: Review and correct or approve minutes of previous progress meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.
 - a. Contractor's Construction Schedule: Review progress since the last meeting. Determine whether each activity is on time, ahead of schedule, or behind schedule, in relation to Contractor's construction schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.
 - 1) Review schedule for next period.
 - b. Review present and future needs of each entity present, including the following:
 - 1) Interface requirements.
 - 2) Sequence of operations.
 - 3) Status of submittals.
 - 4) Deliveries.
 - 5) Off-site fabrication.
 - 6) Access.
 - 7) Site utilization.
 - 8) Temporary facilities and controls.
 - 9) Progress cleaning.
 - 10) Quality and work standards.
 - 11) Status of correction of deficient items.
 - 12) Field observations.
 - 13) Status of RFIs.
 - 14) Status of proposal requests.
 - 15) Pending changes.

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- 16) Status of Change Orders.
 - 17) Pending claims and disputes.
 - 18) Documentation of information for payment requests.
4. Minutes: Entity responsible for conducting the meeting will record and distribute the meeting minutes to each party present and to parties requiring information.
- a. Schedule Updating: Revise Contractor's construction schedule after each progress meeting where revisions to the schedule have been made or recognized. Issue revised schedule concurrently with the report of each meeting.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 013100

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SECTION 013200 - CONSTRUCTION PROGRESS DOCUMENTATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes administrative and procedural requirements for documenting the progress of construction during performance of the Work, including the following:
 - 1. Start-up construction schedule.
 - 2. Contractor's construction schedule.
- B. Related Sections:
 - 1. Division 01 Section "Submittal Procedures" for submitting schedules and reports.
 - 2. Division 01 Section "Quality Requirements" for submitting a schedule of tests and inspections.

1.3 DEFINITIONS

- A. Activity: A discrete part of a project that can be identified for planning, scheduling, monitoring, and controlling the construction project. Activities included in a construction schedule consume time and resources.
 - 1. Critical Activity: An activity on the critical path that must start and finish on the planned early start and finish times.
 - 2. Predecessor Activity: An activity that precedes another activity in the network.
 - 3. Successor Activity: An activity that follows another activity in the network.
- B. Cost Loading: The allocation of the schedule of values for the completion of an activity as scheduled. The sum of costs for all activities must equal the total Contract Sum, unless otherwise approved by Architect.
- C. CPM: Critical path method, which is a method of planning and scheduling a construction project where activities are arranged based on activity relationships. Network calculations determine when activities can be performed and the critical path of the Project.
- D. Critical Path: The longest connected chain of interdependent activities through the network schedule that establishes the minimum overall Project duration and contains no float.

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- E. Event: The starting or ending point of an activity.
- F. Float: The measure of leeway in starting and completing an activity.
 - 1. Float time is not for the exclusive use or benefit of either Owner or Contractor, but is a jointly owned, expiring Project resource available to both parties as needed to meet schedule milestones and Contract completion date.
 - 2. Free float is the amount of time an activity can be delayed without adversely affecting the early start of the successor activity.
 - 3. Total float is the measure of leeway in starting or completing an activity without adversely affecting the planned Project completion date.
- G. Resource Loading: The allocation of manpower and equipment necessary for the completion of an activity as scheduled.

1.4 INFORMATIONAL SUBMITTALS

- A. Format for Submittals: Submit required submittals in the following format:
 - 1. PDF electronic file.
 - 2. Two paper copies.
- B. Start-up construction schedule.
 - 1. Approval of cost-loaded start-up construction schedule will not constitute approval of schedule of values for cost-loaded activities.
- C. Start-up Network Diagram: Of size required to display entire network for entire construction period. Show logic ties for activities.
- D. Contractor's Construction Schedule: Initial schedule, of size required to display entire schedule for entire construction period.
 - 1. Submit a working electronic copy of schedule, using software indicated, and labeled to comply with requirements for submittals. Include type of schedule (initial or updated) and date on label.
- E. CPM Reports: Concurrent with CPM schedule, submit each of the following reports. Format for each activity in reports shall contain activity number, activity description, cost and resource loading, original duration, remaining duration, early start date, early finish date, late start date, late finish date, and total float in calendar days.
 - 1. Activity Report: List of all activities sorted by activity number and then early start date, or actual start date if known.
 - 2. Logic Report: List of preceding and succeeding activities for all activities, sorted in ascending order by activity number and then early start date, or actual start date if known.
 - 3. Total Float Report: List of all activities sorted in ascending order of total float.
 - 4. Earnings Report: Compilation of Contractor's total earnings from the Notice to Proceed until most recent Application for Payment.

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F. Qualification Data: For scheduling consultant.

1.5 QUALITY ASSURANCE

- A. Scheduling Consultant Qualifications: An experienced specialist in CPM scheduling and reporting, with capability of producing CPM reports and diagrams within 24 hours of Architect's request.
- B. Prescheduling Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination." Review methods and procedures related to the preliminary construction schedule and Contractor's construction schedule, including, but not limited to, the following:
1. Review software limitations and content and format for reports.
 2. Verify availability of qualified personnel needed to develop and update schedule.
 3. Discuss constraints, including phasing, area separations, interim milestones, and partial Owner occupancy.
 4. Review delivery dates for Owner-furnished products.
 5. Review schedule for work of Owner's separate contracts.
 6. Review time required for review of submittals and resubmittals.
 7. Review requirements for tests and inspections by independent testing and inspecting agencies.
 8. Review time required for completion and startup procedures.
 9. Review and finalize list of construction activities to be included in schedule.
 10. Review submittal requirements and procedures.
 11. Review procedures for updating schedule.

1.6 COORDINATION

- A. Coordinate preparation and processing of schedules and reports with performance of construction activities and with scheduling and reporting of separate contractors.
- B. Coordinate Contractor's construction schedule with the schedule of values, submittal schedule, progress reports, payment requests, and other required schedules and reports.
1. Secure time commitments for performing critical elements of the Work from entities involved.
 2. Coordinate each construction activity in the network with other activities and schedule them in proper sequence.

PART 2 - PRODUCTS

2.1 CONTRACTOR'S CONSTRUCTION SCHEDULE, GENERAL

- A. Time Frame: Extend schedule from date established for the Notice to Proceed to date of Substantial Completion.

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1. Contract completion date shall not be changed by submission of a schedule that shows an early completion date, unless specifically authorized by Change Order.
- B. Activities: Treat each story or separate area as a separate numbered activity for each principal element of the Work. Comply with the following:
1. Activity Duration: Define activities so no activity is longer than 20 days, unless specifically allowed by Architect.
 2. Procurement Activities: Include procurement process activities for the following long lead items and major items, requiring a cycle of more than 60 days, as separate activities in schedule. Procurement cycle activities include, but are not limited to, submittals, approvals, purchasing, fabrication, and delivery.
 3. Submittal Review Time: Include review and resubmittal times indicated in Division 01 Section "Submittal Procedures" in schedule. Coordinate submittal review times in Contractor's construction schedule with submittal schedule.
 4. Substantial Completion: Indicate completion in advance of date established for Substantial Completion, and allow time for Architect's administrative procedures necessary for certification of Substantial Completion.
 5. Punch List and Final Completion: Include not more than 30 days for punch list and final completion.
- C. Constraints: Include constraints and work restrictions indicated in the Contract Documents and as follows in schedule, and show how the sequence of the Work is affected.
1. Phasing: Arrange list of activities on schedule by phase.
 2. Work under More Than One Contract: Include a separate activity for each contract.
 3. Work by Owner: Include a separate activity for each portion of the Work performed by Owner.
 4. Products Ordered in Advance: Include a separate activity for each product. Include delivery date indicated in Division 01 Section "Summary." Delivery dates indicated stipulate the earliest possible delivery date.
 5. Work Restrictions: Show the effect of the following items on the schedule:
 - a. Coordination with existing construction.
 - b. Limitations of continued occupancies.
 - c. Uninterruptible services.
 - d. Partial occupancy before Substantial Completion.
 - e. Use of premises restrictions.
 - f. Provisions for future construction.
 - g. Seasonal variations.
 6. Work Stages: Indicate important stages of construction for each major portion of the Work, including, but not limited to, the following:
 - a. Subcontract awards.
 - b. Submittals.
 - c. Purchases.
 - d. Mockups.
 - e. Fabrication.
 - f. Sample testing.

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- g. Deliveries.
 - h. Installation.
 - i. Tests and inspections.
 - j. Adjusting.
 - k. Curing.
 - l. Startup and placement into final use and operation.
7. Construction Areas: Identify each major area of construction for each major portion of the Work. Indicate where each construction activity within a major area must be sequenced or integrated with other construction activities to provide for the following:
- a. Structural completion.
 - b. Permanent space enclosure.
 - c. Completion of mechanical installation.
 - d. Completion of electrical installation.
 - e. Substantial Completion.
- D. Milestones: Include milestones indicated in the Contract Documents in schedule, including, but not limited to, the Notice to Proceed, Substantial Completion, and final completion
- E. Cost Correlation: At the head of schedule, provide a cost correlation line, indicating planned and actual costs. On the line, show dollar volume of the Work performed as of dates used for preparation of payment requests.
- 1. Refer to Division 01 Section "Payment Procedures" for cost reporting and payment procedures.
- F. Upcoming Work Summary: Prepare summary report indicating activities scheduled to occur or commence prior to submittal of next schedule update. Summarize the following issues:
- 1. Unresolved issues.
 - 2. Unanswered RFIs.
 - 3. Rejected or unreturned submittals.
 - 4. Notations on returned submittals.
- G. Recovery Schedule: When periodic update indicates the Work is [14] <Insert number> or more calendar days behind the current approved schedule, submit a separate recovery schedule indicating means by which Contractor intends to regain compliance with the schedule. Indicate changes to working hours, working days, crew sizes, and equipment required to achieve compliance, and date by which recovery will be accomplished.
- H. Computer Scheduling Software: Prepare schedules using current version of a program that has been developed specifically to manage construction schedules.
- 1. Utilize scheduling system agreed to in advance with Owner and Architect.

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2.2 START-UP CONSTRUCTION SCHEDULE

- A. Bar-Chart Schedule: Submit start-up horizontal bar-chart-type construction schedule within seven days of date established for the Notice to Proceed.
- B. Preparation: Indicate each significant construction activity separately. Identify first workday of each week with a continuous vertical line. Outline significant construction activities for first 90 days of construction. Include skeleton diagram for the remainder of the Work and a cash requirement prediction based on indicated activities.

2.3 CONTRACTOR'S CONSTRUCTION SCHEDULE (CPM SCHEDULE)

- A. General: Prepare network diagrams using AON (activity-on-node) format.
- B. Start-up Network Diagram: Submit diagram within 14 days of date established for the Notice to Proceed. Outline significant construction activities for the first 90 days of construction. Include skeleton diagram for the remainder of the Work and a cash requirement prediction based on indicated activities.
- C. CPM Schedule: Prepare Contractor's construction schedule using a time-scaled CPM network analysis diagram for the Work.
 - 1. Develop network diagram in sufficient time to submit CPM schedule so it can be accepted for use no later than 60 days after date established for the Notice to Proceed.
 - a. Failure to include any work item required for performance of this Contract shall not excuse Contractor from completing all work within applicable completion dates, regardless of Architect's approval of the schedule.
 - 2. Conduct educational workshops to train and inform key Project personnel, including subcontractors' personnel, in proper methods of providing data and using CPM schedule information.
 - 3. Establish procedures for monitoring and updating CPM schedule and for reporting progress. Coordinate procedures with progress meeting and payment request dates.
 - 4. Use "one workday" as the unit of time for individual activities. Indicate nonworking days and holidays incorporated into the schedule in order to correlate with Contract Time.
- D. CPM Schedule Preparation: Prepare a list of all activities required to complete the Work. Using the start-up network diagram, prepare a skeleton network to identify probable critical paths.
 - 1. Activities: Indicate the estimated time duration, sequence requirements, and relationship of each activity in relation to other activities. Include estimated time frames for the following activities:
 - a. Preparation and processing of submittals.
 - b. Mobilization and demobilization.
 - c. Purchase of materials.
 - d. Delivery.

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- e. Fabrication.
 - f. Utility interruptions.
 - g. Installation.
 - h. Work by Owner that may affect or be affected by Contractor's activities.
 - i. Testing.
 - j. Punch list and final completion.
 - k. Activities occurring following final completion.
2. Critical Path Activities: Identify critical path activities, including those for interim completion dates. Scheduled start and completion dates shall be consistent with Contract milestone dates.
3. Processing: Process data to produce output data on a computer-drawn, time-scaled network. Revise data, reorganize activity sequences, and reproduce as often as necessary to produce the CPM schedule within the limitations of the Contract Time.
4. Format: Mark the critical path. Locate the critical path near center of network; locate paths with most float near the edges.
- a. Subnetworks on separate sheets are permissible for activities clearly off the critical path.
5. Cost- and Resource-Loading of CPM Schedule: Assign cost to construction activities on the CPM schedule. Do not assign costs to submittal activities. Obtain Architect's approval prior to assigning costs to fabrication and delivery activities. Assign costs under principal subcontracts for testing and commissioning activities, operation and maintenance manuals, punch list activities, Project record documents, and demonstration and training (if applicable), in the amount of 5 percent of the Contract Sum.
- a. Each activity cost shall reflect an appropriate value subject to approval by Architect.
 - b. Total cost assigned to activities shall equal the total Contract Sum.
- E. Contract Modifications: For each proposed contract modification and concurrent with its submission, prepare a time-impact analysis using a network fragment to demonstrate the effect of the proposed change on the overall project schedule.
- F. Initial Issue of Schedule: Prepare initial network diagram from a sorted activity list indicating straight "early start-total float." Identify critical activities. Prepare tabulated reports showing the following:
- 1. Contractor or subcontractor and the Work or activity.
 - 2. Description of activity.
 - 3. Principal events of activity.
 - 4. Immediate preceding and succeeding activities.
 - 5. Early and late start dates.
 - 6. Early and late finish dates.
 - 7. Activity duration in workdays.
 - 8. Total float or slack time.
 - 9. Average size of workforce.
 - 10. Dollar value of activity (coordinated with the schedule of values).

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- G. Schedule Updating: Concurrent with making revisions to schedule, prepare tabulated reports showing the following:
1. Identification of activities that have changed.
 2. Changes in early and late start dates.
 3. Changes in early and late finish dates.
 4. Changes in activity durations in workdays.
 5. Changes in the critical path.
 6. Changes in total float or slack time.
 7. Changes in the Contract Time.
- H. Value Summaries: Prepare two cumulative value lists, sorted by finish dates.
1. In first list, tabulate activity number, early finish date, dollar value, and cumulative dollar value.
 2. In second list, tabulate activity number, late finish date, dollar value, and cumulative dollar value.
 3. In subsequent issues of both lists, substitute actual finish dates for activities completed as of list date.
 4. Prepare list for ease of comparison with payment requests; coordinate timing with progress meetings.
 - a. In both value summary lists, tabulate "actual percent complete" and "cumulative value completed" with total at bottom.
 - b. Submit value summary printouts one week before each regularly scheduled progress meeting.

PART 3 - EXECUTION

3.1 CONTRACTOR'S CONSTRUCTION SCHEDULE

- A. Scheduling Consultant: Engage a consultant to provide planning, evaluation, and reporting using CPM scheduling.
1. In-House Option: Owner may waive the requirement to retain a consultant if Contractor employs skilled personnel with experience in CPM scheduling and reporting techniques. Submit qualifications.
 2. Meetings: Scheduling consultant shall attend all meetings related to Project progress, alleged delays, and time impact.
- B. Contractor's Construction Schedule Updating: At monthly intervals, update schedule to reflect actual construction progress and activities. Issue schedule one week before each regularly scheduled progress meeting.
1. Revise schedule immediately after each meeting or other activity where revisions have been recognized or made. Issue updated schedule concurrently with the report of each such meeting.

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2. Include a report with updated schedule that indicates every change, including, but not limited to, changes in logic, durations, actual starts and finishes, and activity durations.
 3. As the Work progresses, indicate final completion percentage for each activity.
- C. Distribution: Distribute copies of approved schedule to Architect, Owner, separate contractors, testing and inspecting agencies, and other parties identified by Contractor with a need-to-know schedule responsibility.
1. Post copies in Project meeting rooms and temporary field offices.
 2. When revisions are made, distribute updated schedules to the same parties and post in the same locations. Delete parties from distribution when they have completed their assigned portion of the Work and are no longer involved in performance of construction activities.

END OF SECTION 013200

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SECTION 013300 - SUBMITTAL PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes requirements for the submittal schedule and administrative and procedural requirements for submitting Shop Drawings, Product Data, Samples, and other submittals.
- B. Related Sections:
 - 1. Division 01 Section "Payment Procedures" for submitting Applications for Payment and the schedule of values.
 - 2. Division 01 Section "Construction Progress Documentation" for submitting schedules and reports, including Contractor's construction schedule.
 - 3. Division 01 Section "Operation and Maintenance Data" for submitting operation and maintenance manuals.
 - 4. Division 01 Section "Project Record Documents" for submitting record Drawings, record Specifications, and record Product Data.
 - 5. Division 01 Section "Demonstration and Training" for submitting video recordings of demonstration of equipment and training of Owner's personnel.

1.3 DEFINITIONS

- A. Action Submittals: Written and graphic information and physical samples that require Architect's responsive action. Action submittals are those submittals indicated in individual Specification Sections as action submittals.
- B. Informational Submittals: Written and graphic information and physical samples that do not require Architect's responsive action. Submittals may be rejected for not complying with requirements. Informational submittals are those submittals indicated in individual Specification Sections as informational submittals.
- C. File Transfer Protocol (FTP): Communications protocol that enables transfer of files to and from another computer over a network and that serves as the basis for standard Internet protocols. An FTP site is a portion of a network located outside of network firewalls within which internal and external users are able to access files.

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- D. Portable Document Format (PDF): An open standard file format licensed by Adobe Systems used for representing documents in a device-independent and display resolution-independent fixed-layout document format.

1.4 ACTION SUBMITTALS

- A. Submittal Schedule: Submit a schedule of submittals, arranged in chronological order by dates required by construction schedule. Include time required for review, ordering, manufacturing, fabrication, and delivery when establishing dates. Include additional time required for making corrections or modifications to submittals noted by the Architect and additional time for handling and reviewing submittals required by those corrections.
 - 1. Coordinate submittal schedule with list of subcontracts, the schedule of values, and Contractor's construction schedule.
 - 2. Initial Submittal: Submit concurrently with start-up construction schedule. Include submittals required during the first 60 days of construction. List those submittals required to maintain orderly progress of the Work and those required early because of long lead time for manufacture or fabrication.
 - 3. Final Submittal: Submit concurrently with the first complete submittal of Contractor's construction schedule.
 - a. Submit revised submittal schedule to reflect changes in current status and timing for submittals.
 - 4. Format: Arrange the following information in a tabular format:
 - a. Scheduled date for first submittal.
 - b. Specification Section number and title.
 - c. Submittal category: Action, informational.
 - d. Name of subcontractor.
 - e. Description of the Work covered.
 - f. Scheduled date for Architect's final release or approval.
 - g. Scheduled dates for purchasing.
 - h. Scheduled dates for installation.
 - i. Activity or event number.

1.5 SUBMITTAL ADMINISTRATIVE REQUIREMENTS

- A. Architect's Digital Data Files: Electronic copies of CAD Drawings of the Contract Drawings will not be provided by Architect for Contractor's use in preparing submittals.
 - 1. Architect will furnish Contractor one set of digital data drawing files of the Contract Drawings for use in preparing Shop Drawings and Project record drawings.
 - a. Architect makes no representations as to the accuracy or completeness of digital data drawing files as they relate to the Contract Drawings.

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- b. Digital Drawing Software Program: The Contract Drawings are available in AutoCAD dwg.format.
 - c. Contractor shall execute a data licensing agreement in the form of an Agreement form acceptable to the Owner and Architect.
- B. Coordination: Coordinate preparation and processing of submittals with performance of construction activities.
- 1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.
 - 2. Submit all submittal items required for each Specification Section concurrently unless partial submittals for portions of the Work are indicated on approved submittal schedule.
 - 3. Submit action submittals and informational submittals required by the same Specification Section as separate packages under separate transmittals.
 - 4. Coordinate transmittal of different types of submittals for related parts of the Work so processing will not be delayed because of need to review submittals concurrently for coordination.
 - a. Architect reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.
- C. Processing Time: Allow time for submittal review, including time for resubmittals, as follows. Time for review shall commence on Architect's receipt of submittal. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing, including resubmittals.
- 1. Initial Review: Allow 10 working days for initial review of each submittal. Allow additional time if coordination with subsequent submittals is required. Architect will advise Contractor when a submittal being processed must be delayed for coordination.
 - 2. Intermediate Review: If intermediate submittal is necessary, process it in same manner as initial submittal.
 - 3. Resubmittal Review: Allow 10 working days for review of each resubmittal.
- D. Identification and Information: Place a permanent label or title block on each paper copy submittal item for identification.
- 1. Indicate name of firm or entity that prepared each submittal on label or title block.
 - 2. Provide a space approximately 6 by 8 inches (150 by 200 mm) on label or beside title block to record Contractor's review and approval markings and action taken by Architect.
 - 3. Include the following information for processing and recording action taken:
 - a. Project name.
 - b. Date.
 - c. Name of Architect.
 - d. Name of Construction Manager.
 - e. Name of Contractor.
 - f. Name of subcontractor.
 - g. Name of supplier.
 - h. Name of manufacturer.

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- i. Submittal number or other unique identifier, including revision identifier.
 - 1) Submittal number shall use Specification Section number followed by a decimal point and then a sequential number (e.g., 061000.01). Resubmittals shall include an alphabetic suffix after another decimal point (e.g., 061000.01.A).
 - j. Number and title of appropriate Specification Section.
 - k. Drawing number and detail references, as appropriate.
 - l. Location(s) where product is to be installed, as appropriate.
 - m. Other necessary identification.
- E. Identification and Information: Identify and incorporate information in each electronic submittal file as follows:
- 1. Assemble complete submittal package into a single indexed file with links enabling navigation to each item.
 - 2. Name file with submittal number or other unique identifier, including revision identifier.
 - a. File name shall use project identifier and Specification Section number followed by a decimal point and then a sequential number (e.g., LNHS-061000.01). Resubmittals shall include an alphabetic suffix after another decimal point (e.g., LNHS-061000.01.A).
 - 3. Provide means for insertion to permanently record Contractor's review and approval markings and action taken by Architect.
 - 4. Include the following information on an inserted cover sheet:
 - a. Project name.
 - b. Date.
 - c. Name and address of Architect.
 - d. Name of Construction Manager.
 - e. Name of Contractor.
 - f. Name of firm or entity that prepared submittal.
 - g. Name of subcontractor.
 - h. Name of supplier.
 - i. Name of manufacturer.
 - j. Number and title of appropriate Specification Section.
 - k. Drawing number and detail references, as appropriate.
 - l. Location(s) where product is to be installed, as appropriate.
 - m. Related physical samples submitted directly.
 - n. Other necessary identification.
 - 5. Include the following information as keywords in the electronic file metadata:
 - a. Project name.
 - b. Number and title of appropriate Specification Section.
 - c. Manufacturer name.
 - d. Product name.

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- F. Options: Identify options requiring selection by the Architect.
- G. Deviations: Identify deviations from the Contract Documents on submittals.
- H. Additional Paper Copies: Unless additional copies are required for final submittal, and unless Architect observes noncompliance with provisions in the Contract Documents, initial submittal may serve as final submittal.
- I. Transmittal: Assemble each submittal individually and appropriately for transmittal and handling. Transmit each submittal using a transmittal form. Architect will return submittals, without review, received from sources other than Contractor.
 - 1. Transmittal Form: Use AIA Document G810.
 - 2. Transmittal Form: Provide locations on form for the following information:
 - a. Project name.
 - b. Date.
 - c. Destination (To:).
 - d. Source (From:).
 - e. Names of subcontractor, manufacturer, and supplier.
 - f. Category and type of submittal.
 - g. Submittal purpose and description.
 - h. Specification Section number and title.
 - i. Indication of full or partial submittal.
 - j. Drawing number and detail references, as appropriate.
 - k. Transmittal number, numbered consecutively.
 - l. Submittal and transmittal distribution record.
 - m. Remarks.
 - n. Signature of transmitter.
 - 3. On an attached separate sheet, prepared on Contractor's letterhead, record relevant information, requests for data, revisions other than those requested by Architect on previous submittals, and deviations from requirements in the Contract Documents, including minor variations and limitations. Include same identification information as related submittal.
- J. Resubmittals: Make resubmittals in same form and number of copies as initial submittal.
 - 1. Note date and content of previous submittal.
 - 2. Note date and content of revision in label or title block and clearly indicate extent of revision.
 - 3. Resubmit submittals until they are marked with approval notation from Architect's action stamp.
- K. Distribution: Furnish copies of final submittals to manufacturers, subcontractors, suppliers, fabricators, installers, authorities having jurisdiction, and others as necessary for performance of construction activities. Show distribution on transmittal forms.

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- L. Use for Construction: Use only final submittals that are marked with approval notation from Architect's action stamp.

PART 2 - PRODUCTS

2.1 SUBMITTAL PROCEDURES

- A. General Submittal Procedure Requirements: Prepare and submit submittals required by individual Specification Sections. Types of submittals are indicated in individual Specification Sections.
 - 1. Submit electronic submittals via email as PDF electronic files.
 - a. Architect will return annotated file. Annotate and retain one copy of file as an electronic Project record document file.
 - 2. Action Submittals: Submit three paper copies of each submittal, unless otherwise indicated. Architect, through Construction Manager, will return two copies.
 - 3. Informational Submittals: Submit two paper copies of each submittal, unless otherwise indicated. Architect will return copies.
 - 4. Closeout Submittals and Maintenance Material Submittals: Comply with requirements specified in Division 01 Section "Closeout Procedures."
 - 5. Certificates and Certifications Submittals: Provide a statement that includes signature of entity responsible for preparing certification. Certificates and certifications shall be signed by an officer or other individual authorized to sign documents on behalf of that entity.
 - a. Provide a digital signature with digital certificate on electronically-submitted certificates and certifications where indicated.
 - b. Provide a notarized statement on original paper copy certificates and certifications where indicated.
 - 6. Test and Inspection Reports Submittals: Comply with requirements specified in Division 01 Section "Quality Requirements."
- B. Product Data: Collect information into a single submittal for each element of construction and type of product or equipment.
 - 1. If information must be specially prepared for submittal because standard published data are not suitable for use, submit as Shop Drawings, not as Product Data.
 - 2. Mark each copy of each submittal to show which products and options are applicable.
 - 3. Include the following information, as applicable:
 - a. Manufacturer's catalog cuts.
 - b. Manufacturer's product specifications.
 - c. Standard color charts.
 - d. Statement of compliance with specified referenced standards.

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- e. Testing by recognized testing agency.
 - f. Application of testing agency labels and seals.
 - g. Notation of coordination requirements.
 - h. Availability and delivery time information.
4. For equipment, include the following in addition to the above, as applicable:
- a. Wiring diagrams showing factory-installed wiring.
 - b. Printed performance curves.
 - c. Operational range diagrams.
 - d. Clearances required to other construction, if not indicated on accompanying Shop Drawings.
5. Submit Product Data before or concurrent with Samples.
6. Submit Product Data in the following format:
- a. PDF electronic file.
 - b. Three paper copies of Product Data, unless otherwise indicated. Architect, will return two copies.
- C. Shop Drawings: Prepare Project-specific information, drawn accurately to scale. Do not base Shop Drawings on reproductions of the Contract Documents or standard printed data.
1. Preparation: Fully illustrate requirements in the Contract Documents. Include the following information, as applicable:
- a. Identification of products.
 - b. Schedules.
 - c. Compliance with specified standards.
 - d. Notation of coordination requirements.
 - e. Notation of dimensions established by field measurement.
 - f. Relationship and attachment to adjoining construction clearly indicated.
 - g. Seal and signature of professional engineer if specified.
2. Sheet Size: Except for templates, patterns, and similar full-size drawings, submit Shop Drawings on sheets at least 8-1/2 by 11 inches (215 by 280 mm) but no larger than 24 by 36 inches.
3. Submit Shop Drawings in the following format:
- a. PDF electronic file.
 - b. Three opaque (bond) copies of each submittal. Architect will return two copies.
- D. Samples: Submit Samples for review of kind, color, pattern, and texture for a check of these characteristics with other elements and for a comparison of these characteristics between submittal and actual component as delivered and installed.
1. Transmit Samples that contain multiple, related components such as accessories together in one submittal package.
2. Identification: Attach label on unexposed side of Samples that includes the following:

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- a. Generic description of Sample.
 - b. Product name and name of manufacturer.
 - c. Sample source.
 - d. Number and title of applicable Specification Section.
3. Disposition: Maintain sets of approved Samples at Project site, available for quality-control comparisons throughout the course of construction activity. Sample sets may be used to determine final acceptance of construction associated with each set.
- a. Samples that may be incorporated into the Work are indicated in individual Specification Sections. Such Samples must be in an undamaged condition at time of use.
 - b. Samples not incorporated into the Work, or otherwise designated as Owner's property, are the property of Contractor.
4. Samples for Initial Selection: Submit manufacturer's color charts consisting of units or sections of units showing the full range of colors, textures, and patterns available.
- a. Number of Samples: Submit one full set(s) of available choices where color, pattern, texture, or similar characteristics are required to be selected from manufacturer's product line. Architect will return submittal with options selected.
5. Samples for Verification: Submit full-size units or Samples of size indicated, prepared from same material to be used for the Work, cured and finished in manner specified, and physically identical with material or product proposed for use, and that show full range of color and texture variations expected. Samples include, but are not limited to, the following: partial sections of manufactured or fabricated components; small cuts or containers of materials; complete units of repetitively used materials; swatches showing color, texture, and pattern; color range sets; and components used for independent testing and inspection.
- a. Number of Samples: Submit three sets of Samples. Architect will retain two Sample sets; remainder will be returned.
 - 1) Submit a single Sample where assembly details, workmanship, fabrication techniques, connections, operation, and other similar characteristics are to be demonstrated.
 - 2) If variation in color, pattern, texture, or other characteristic is inherent in material or product represented by a Sample, submit at least three sets of paired units that show approximate limits of variations.
- E. Product Schedule: As required in individual Specification Sections, prepare a written summary indicating types of products required for the Work and their intended location. Include the following information in tabular form:
1. Type of product. Include unique identifier for each product indicated in the Contract Documents.
 2. Manufacturer and product name, and model number if applicable.
 3. Number and name of room or space.

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4. Location within room or space.
5. Submit product schedule in the following format:
 - a. PDF electronic file.
 - b. Three paper copies of product schedule or list, unless otherwise indicated. Architect will return two copies.

- F. Contractor's Construction Schedule: Comply with requirements specified in Division 01 Section "Construction Progress Documentation."

- G. Application for Payment: Comply with requirements specified in Division 01 Section "Payment Procedures."

- H. Schedule of Values: Comply with requirements specified in Division 01 Section "Payment Procedures."

- I. Subcontract List: Prepare a written summary identifying individuals or firms proposed for each portion of the Work, including those who are to furnish products or equipment fabricated to a special design. Include the following information in tabular form:
 1. Name, address, and telephone number of entity performing subcontract or supplying products.
 2. Number and title of related Specification Section(s) covered by subcontract.
 3. Drawing number and detail references, as appropriate, covered by subcontract.
 4. Submit subcontract list in the following format:
 - a. PDF electronic file.
 - b. Number of Copies: Three paper copies of subcontractor list, unless otherwise indicated. Architect will return two copies.

- J. Coordination Drawings: Comply with requirements specified in Division 01 Section "Project Management and Coordination."

- K. Qualification Data: Prepare written information that demonstrates capabilities and experience of firm or person. Include lists of completed projects with project names and addresses, contact information of architects and owners, and other information specified.

- L. Welding Certificates: Prepare written certification that welding procedures and personnel comply with requirements in the Contract Documents. Submit record of Welding Procedure Specification and Procedure Qualification Record on American Welding Society (AWS) forms. Include names of firms and personnel certified.

- M. Installer Certificates: Submit written statements on manufacturer's letterhead certifying that Installer complies with requirements in the Contract Documents and, where required, is authorized by manufacturer for this specific Project.

- N. Manufacturer Certificates: Submit written statements on manufacturer's letterhead certifying that manufacturer complies with requirements in the Contract Documents. Include evidence of manufacturing experience where required.

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- O. Product Certificates: Submit written statements on manufacturer's letterhead certifying that product complies with requirements in the Contract Documents.
- P. Material Certificates: Submit written statements on manufacturer's letterhead certifying that material complies with requirements in the Contract Documents.
- Q. Material Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting test results of material for compliance with requirements in the Contract Documents.
- R. Product Test Reports: Submit written reports indicating current product produced by manufacturer complies with requirements in the Contract Documents. Base reports on evaluation of tests performed by manufacturer and witnessed by a qualified testing agency, or on comprehensive tests performed by a qualified testing agency.
- S. Research Reports: Submit written evidence, from a model code organization acceptable to authorities having jurisdiction, that product complies with building code in effect for Project. Include the following information:
 - 1. Name of evaluation organization.
 - 2. Date of evaluation.
 - 3. Time period when report is in effect.
 - 4. Product and manufacturers' names.
 - 5. Description of product.
 - 6. Test procedures and results.
 - 7. Limitations of use.
- T. Schedule of Tests and Inspections: Comply with requirements specified in Division 01 Section "Quality Requirements."
- U. Preconstruction Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of tests performed before installation of product, for compliance with performance requirements in the Contract Documents.
- V. Compatibility Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of compatibility tests performed before installation of product. Include written recommendations for primers and substrate preparation needed for adhesion.
- W. Field Test Reports: Submit reports indicating and interpreting results of field tests performed either during installation of product or after product is installed in its final location, for compliance with requirements in the Contract Documents.
- X. Maintenance Data: Comply with requirements specified in Division 01 Section "Operation and Maintenance Data."
- Y. Design Data: Prepare and submit written and graphic information, including, but not limited to, performance and design criteria, list of applicable codes and regulations, and calculations. Include list of assumptions and other performance and design criteria and a summary of loads.

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Include load diagrams if applicable. Provide name and version of software, if any, used for calculations. Include page numbers.

2.2 DELEGATED-DESIGN SERVICES

- A. Performance and Design Criteria: Where professional design services or certifications by a design professional are specifically required of Contractor by the Contract Documents, provide products and systems complying with specific performance and design criteria indicated.
 - 1. If criteria indicated are not sufficient to perform services or certification required, submit a written request for additional information to Architect.
- B. Delegated-Design Services Certification: In addition to Shop Drawings, Product Data, and other required submittals, submit digitally-signed PDF electronic file and three paper copies of certificate, signed and sealed by the responsible design professional, for each product and system specifically assigned to Contractor to be designed or certified by a design professional.
 - 1. Indicate that products and systems comply with performance and design criteria in the Contract Documents. Include list of codes, loads, and other factors used in performing these services.

PART 3 - EXECUTION

3.1 CONTRACTOR'S REVIEW

- A. Action and Informational Submittals: Review each submittal and check for coordination with other Work of the Contract and for compliance with the Contract Documents. Note corrections and field dimensions. Mark with approval stamp before submitting to Architect.
- B. Project Closeout and Maintenance/Material Submittals: Refer to requirements in Division 01 Section "Closeout Procedures."
- C. Approval Stamp: Stamp each submittal with a uniform, approval stamp. Include Project name and location, submittal number, Specification Section title and number, name of reviewer, date of Contractor's approval, and statement certifying that submittal has been reviewed, checked, and approved for compliance with the Contract Documents.

3.2 ARCHITECT'S ACTION

- A. General: Architect will not review submittals that do not bear Contractor's approval stamp and will return them without action.
- B. Action Submittals: Architect will review each submittal, make marks to indicate corrections or modifications required, and return it. Architect will stamp each submittal with an action stamp and will mark stamp appropriately to indicate action.

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- C. Informational Submittals: Architect will review each submittal and will not return it, or will return it if it does not comply with requirements. Architect will forward each submittal to appropriate party.
- D. Partial submittals prepared for a portion of the Work will be reviewed when use of partial submittals has received prior approval from Architect.
- E. Incomplete submittals are not acceptable, will be considered nonresponsive, and will be returned without review.
- F. Submittals not required by the Contract Documents may not be reviewed and may be discarded.

END OF SECTION 013300

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SECTION 015000 - TEMPORARY FACILITIES AND CONTROLS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes requirements for temporary utilities, support facilities, and security and protection facilities.
- B. Related Sections:
 - 1. Division 01 Section "Summary" for work restrictions and limitations on utility interruptions.

1.3 USE CHARGES

- A. General: Installation and removal of and use charges for temporary facilities shall be included in the Contract Sum unless otherwise indicated. Allow other entities to use temporary services and facilities without cost, including, but not limited to, Owner's representatives, Architect, testing agencies, and authorities having jurisdiction.
- B. Sewer Service: Pay sewer service use charges for sewer usage by all entities for construction operations.
- C. Water Service: Pay water service use charges for water used by all entities for construction operations.
- D. Electric Power Service: Pay electric power service use charges for electricity used by all entities for construction operations.

1.4 INFORMATIONAL SUBMITTALS

- A. Site Plan: Show temporary facilities, utility hookups, staging areas, and parking areas for construction personnel.
- B. Erosion- and Sedimentation-Control Plan: Show compliance with requirements of EPA Construction General Permit or authorities having jurisdiction, whichever is more stringent.

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- C. Moisture-Protection Plan: Describe procedures and controls for protecting materials and construction from water absorption and damage, including delivery, handling, and storage provisions for materials subject to water absorption or water damage, discarding water-damaged materials, protocols for mitigating water intrusion into completed Work, and replacing water damaged Work.
 - 1. Indicate sequencing of work that requires water, such as sprayed fire-resistive materials, plastering, and terrazzo grinding, and describe plans for dealing with water from these operations. Show procedures for verifying that wet construction has dried sufficiently to permit installation of finish materials.
- D. Dust-Control and HVAC-Control Plan: Submit coordination drawing and narrative that indicates the dust-control and HVAC-control measures proposed for use, proposed locations, and proposed time frame for their operation. Identify further options if proposed measures are later determined to be inadequate. Include the following:
 - 1. Locations of dust-control partitions at each phase of the work.
 - 2. HVAC system isolation schematic drawing.
 - 3. Location of proposed air filtration system discharge.
 - 4. Other dust-control measures.
 - 5. Waste management plan.

1.5 QUALITY ASSURANCE

- A. Electric Service: Comply with NECA, NEMA, and UL standards and regulations for temporary electric service. Install service to comply with NFPA 70.
- B. Tests and Inspections: Arrange for authorities having jurisdiction to test and inspect each temporary utility before use. Obtain required certifications and permits.
- C. Accessible Temporary Egress: Comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines and [ICC/ANSI A117.1.

1.6 PROJECT CONDITIONS

- A. Temporary Use of Permanent Facilities: Engage installer of each permanent service to assume responsibility for operation, maintenance, and protection of each permanent service during its use as a construction facility before Owner's acceptance, regardless of previously assigned responsibilities.

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PART 2 - PRODUCTS

2.1 MATERIALS

- A. Chain-Link Fencing: Minimum 2-inch (50-mm), 0.148-inch- (3.8-mm-) thick, galvanized steel, chain-link fabric fencing; minimum 6 feet (1.8 m) high with galvanized steel pipe posts; minimum 2-3/8-inch- (60-mm-) OD line posts and 2-7/8-inch- (73-mm-) OD corner and pull posts, with 1-5/8-inch- (42-mm-) OD top rails.
- B. Portable Chain-Link Fencing: Minimum 2-inch (50-mm), 0.148-inch- (3.8-mm-) thick, galvanized steel, chain-link fabric fencing; minimum 6 feet (1.8 m) high with galvanized steel pipe posts; minimum 2-3/8-inch- (60-mm-) OD line posts and 2-7/8-inch- (73-mm-) OD corner and pull posts, with 1-5/8-inch- (42-mm-) OD top and bottom rails. Provide concrete galvanized steel bases for supporting posts.
- C. Polyethylene Sheet: Reinforced, fire-resistive sheet, 10 mils (0.25 mm) minimum thickness, with flame-spread rating of 15 or less per ASTM E 84.
- D. Dust Control Adhesive-Surface Walk-off Mats: Provide mats minimum 36 by 60 inches (914 by 1624 mm).
- E. Insulation: Unfaced mineral-fiber blanket, manufactured from glass, slag wool, or rock wool; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively.

2.2 TEMPORARY FACILITIES

- A. Field Offices, General: Prefabricated or mobile units with serviceable finishes, temperature controls, and foundations adequate for normal loading.
- B. Common-Use Field Office: Of sufficient size to accommodate needs of Owner, Architect, and construction personnel office activities and to accommodate project meetings specified in other Division 01 Sections. Keep office clean and orderly. Furnish and equip offices as follows:
 - 1. Furniture required for Project-site documents including file cabinets, plan tables, plan racks, and bookcases.
 - 2. Conference room of sufficient size to accommodate meetings of 10 individuals. Provide electrical power service and 120-V ac duplex receptacles, with not less than 1 receptacle on each wall. Furnish room with conference table, chairs, and 4-foot- (1.2-m-) square tack and marker boards.
 - 3. Drinking water and private toilet.
 - 4. Coffee machine and supplies.
 - 5. Heating and cooling equipment necessary to maintain a uniform indoor temperature of 68 to 72 deg F (20 to 22 deg C).
 - 6. Lighting fixtures capable of maintaining average illumination of 20 fc (215 lx) at desk height.

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- C. Storage and Fabrication Sheds: Provide sheds sized, furnished, and equipped to accommodate materials and equipment for construction operations.

- 1. Store combustible materials apart from building.

2.3 EQUIPMENT

- A. Fire Extinguishers: Portable, UL rated; with class and extinguishing agent as required by locations and classes of fire exposures.

- B. HVAC Equipment: Unless Owner authorizes use of permanent HVAC system, provide vented, self-contained, liquid-propane-gas or fuel-oil heaters with individual space thermostatic control.

- 1. Use of gasoline-burning space heaters, open-flame heaters, or salamander-type heating units is prohibited.
 - 2. Heating Units: Listed and labeled for type of fuel being consumed, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
 - 3. Permanent HVAC System: If Owner authorizes use of permanent HVAC system for temporary use during construction, provide filter with MERV of 8 at each return air grille in system and remove at end of construction and clean HVAC system as required in Division 01 Section "Closeout Procedures".

- C. Air Filtration Units: HEPA primary and secondary filter-equipped portable units with four-stage filtration. Provide single switch for emergency shutoff. Configure to run continuously.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Locate facilities where they will serve Project adequately and result in minimum interference with performance of the Work. Relocate and modify facilities as required by progress of the Work.

- 1. Locate facilities to limit site disturbance as specified in Division 01 Section "Summary."

- B. Provide each facility ready for use when needed to avoid delay. Do not remove until facilities are no longer needed or are replaced by authorized use of completed permanent facilities.

3.2 TEMPORARY UTILITY INSTALLATION

- A. General: Install temporary service or connect to existing service.

- 1. Arrange with utility company, Owner, and existing users for time when service can be interrupted, if necessary, to make connections for temporary services.

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- B. Water Service: Install water service and distribution piping in sizes and pressures adequate for construction.
- C. Sanitary Facilities: Provide temporary toilets, wash facilities, and drinking water for use of construction personnel. Comply with requirements of authorities having jurisdiction for type, number, location, operation, and maintenance of fixtures and facilities.
- D. Heating and Cooling: Provide temporary heating and cooling required by construction activities for curing or drying of completed installations or for protecting installed construction from adverse effects of low temperatures or high humidity. Select equipment that will not have a harmful effect on completed installations or elements being installed.
- E. Isolation of Work Areas in Occupied Facilities: Prevent dust, fumes, and odors from entering occupied areas.
- F. Ventilation and Humidity Control: Provide temporary ventilation required by construction activities for curing or drying of completed installations or for protecting installed construction from adverse effects of high humidity. Select equipment that will not have a harmful effect on completed installations or elements being installed. Coordinate ventilation requirements to produce ambient condition required and minimize energy consumption.
 - 1. Provide dehumidification systems when required to reduce substrate moisture levels to level required to allow installation or application of finishes.
- G. Electric Power Service: Provide electric power service and distribution system of sufficient size, capacity, and power characteristics required for construction operations.
 - 1. Install electric power service overhead, unless otherwise indicated.
 - 2. Connect temporary service to Owner's existing power source, as directed by Owner.
- H. Lighting: Provide temporary lighting with local switching that provides adequate illumination for construction operations, observations, inspections, and traffic conditions.
 - 1. Install and operate temporary lighting that fulfills security and protection requirements without operating entire system.
- I. Telephone Service: Provide temporary telephone service in common-use facilities for use by all construction personnel. Install one telephone line(s) for each field office.
 - 1. Provide additional telephone lines for the following:
 - a. Provide a dedicated telephone line for each facsimile machine in each field office.
 - 2. At each telephone, post a list of important telephone numbers.
 - a. Police and fire departments.
 - b. Ambulance service.
 - c. Contractor's home office.
 - d. Architect's office.

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- e. Engineers' offices.
 - f. Owner's office.
 - g. Principal subcontractors' field and home offices.
3. Provide superintendent with cellular telephone or portable two-way radio for use when away from field office.
- J. Electronic Communication Service: Provide a desktop computer in the primary field office adequate for use by Contractor to access project electronic documents and maintain electronic communications. Equip computer with not less than the following:
- 1. Processor: Intel Pentium D or Intel CoreDuo, 1.8 GHz processing speed.
 - 2. Memory: 2 gigabyte.
 - 3. Disk storage: 80 gigabyte hard disk drive and combination DVD-RW/CD-RW drive.
 - 4. Display: 19-inch (480-mm) LCD monitor with 128 Mb dedicated video RAM.
 - 5. Full-size keyboard and mouse.
 - 6. Network Connectivity: 10/100BaseT Ethernet.
 - 7. Operating System: Microsoft Windows XP Professional or Microsoft Windows Vista Business.
 - 8. Productivity Software:
 - a. Microsoft Office Professional, XP or higher, including Word, Excel, and Outlook.
 - b. Adobe Reader 7.0 or higher.
 - c. WinZip 7.0 or higher.
 - 9. Printer: "All-in-one" unit equipped with printer server, combining color printing, photocopying, scanning, and faxing, or separate units for each of these 3 functions.
 - 10. Internet Service: Broadband modem, router and ISP, equipped with hardware firewall, providing minimum 384 Kbps upload and 1 Mbps download speeds at each computer.
 - 11. Internet Security: Integrated software, providing software firewall, virus, spyware, phishing and spam protection in a combined application.
 - 12. Backup: External hard drive, minimum 40 gigabyte, with automated backup software providing daily backups.

3.3 SUPPORT FACILITIES INSTALLATION

- A. General: Comply with the following:
- 1. Provide construction for temporary offices, shops, and sheds located within construction area or within 30 feet (9 m) of building lines that is noncombustible according to ASTM E 136. Comply with NFPA 241.
 - 2. Maintain support facilities until Architect schedules Substantial Completion inspection. Remove before Substantial Completion. Personnel remaining after Substantial Completion will be permitted to use permanent facilities, under conditions acceptable to Owner.

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- B. Temporary Roads and Paved Areas: Construct and maintain temporary roads and paved areas adequate for construction operations. Locate temporary roads and paved areas as indicated on Drawings.
 - 1. Provide dust-control treatment that is nonpolluting and nontracking. Reapply treatment as required to minimize dust.
- C. Traffic Controls: Comply with requirements of authorities having jurisdiction.
 - 1. Protect existing site improvements to remain including curbs, pavement, and utilities.
 - 2. Maintain access for fire-fighting equipment and access to fire hydrants.
- D. Parking: Provide temporary parking areas for construction personnel.
- E. Dewatering Facilities and Drains: Comply with requirements of authorities having jurisdiction. Maintain Project site, excavations, and construction free of water.
 - 1. Dispose of rainwater in a lawful manner that will not result in flooding Project or adjoining properties nor endanger permanent Work or temporary facilities.
 - 2. Remove snow and ice as required to minimize accumulations.
- F. Project Signs: Provide Project signs as indicated. Unauthorized signs are not permitted.
 - 1. Identification Signs: Provide Project identification signs as indicated on Drawings.
 - 2. Temporary Signs: Provide other signs as indicated and as required to inform public and individuals seeking entrance to Project.
 - a. Provide temporary, directional signs for construction personnel and visitors.
 - 3. Maintain and touchup signs so they are legible at all times.
- G. Waste Disposal Facilities: Provide waste-collection containers in sizes adequate to handle waste from construction operations. Comply with requirements of authorities having jurisdiction. Comply with Division 01 Section "Execution" for progress cleaning requirements.

3.4 SECURITY AND PROTECTION FACILITIES INSTALLATION

- A. Environmental Protection: Provide protection, operate temporary facilities, and conduct construction as required to comply with environmental regulations and that minimize possible air, waterway, and subsoil contamination or pollution or other undesirable effects.
 - 1. Comply with work restrictions specified in Division 01 Section "Summary."
- B. Temporary Erosion and Sedimentation Control: Provide measures to prevent soil erosion and discharge of soil-bearing water runoff and airborne dust to undisturbed areas and to adjacent properties and walkways, according to erosion- and sedimentation-control Drawings.

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1. Verify that flows of water redirected from construction areas or generated by construction activity do not enter or cross tree- or plant- protection zones.
 2. Inspect, repair, and maintain erosion- and sedimentation-control measures during construction until permanent vegetation has been established.
 3. Clean, repair, and restore adjoining properties and roads affected by erosion and sedimentation from the project site during the course of the project.
 4. Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.
- C. Stormwater Control: Comply with requirements of authorities having jurisdiction. Provide barriers in and around excavations and subgrade construction to prevent flooding by runoff of stormwater from heavy rains.
- D. Tree and Plant Protection: Install temporary fencing located as indicated or outside the drip line of trees to protect vegetation from damage from construction operations. Protect tree root systems from damage, flooding, and erosion.
- E. Pest Control: Engage pest-control service to recommend practices to minimize attraction and harboring of rodents, roaches, and other pests and to perform extermination and control procedures at regular intervals so Project will be free of pests and their residues at Substantial Completion. Obtain extended warranty for Owner. Perform control operations lawfully, using environmentally safe materials.
- F. Site Enclosure Fence: Before construction operations begin, furnish and install site enclosure fence in a manner that will prevent people and animals from easily entering site except by entrance gates.
1. Extent of Fence: As required to enclose entire Project site or portion determined sufficient to accommodate construction operations.
- G. Barricades, Warning Signs, and Lights: Comply with requirements of authorities having jurisdiction for erecting structurally adequate barricades, including warning signs and lighting.
- H. Temporary Egress: Maintain temporary egress from existing occupied facilities as indicated and as required by authorities having jurisdiction.
- I. Temporary Enclosures: Provide temporary enclosures for protection of construction, in progress and completed, from exposure, foul weather, other construction operations, and similar activities. Provide temporary weathertight enclosure for building exterior.
1. Where heating or cooling is needed and permanent enclosure is not complete, insulate temporary enclosures.
- J. Temporary Fire Protection: Install and maintain temporary fire-protection facilities of types needed to protect against reasonably predictable and controllable fire losses. Comply with NFPA 241.
1. Prohibit smoking in construction areas.

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2. Supervise welding operations, combustion-type temporary heating units, and similar sources of fire ignition according to requirements of authorities having jurisdiction.
3. Develop and supervise an overall fire-prevention and -protection program for personnel at Project site. Review needs with local fire department and establish procedures to be followed. Instruct personnel in methods and procedures. Post warnings and information.
4. Provide temporary standpipes and hoses for fire protection. Hang hoses with a warning sign stating that hoses are for fire-protection purposes only and are not to be removed. Match hose size with outlet size and equip with suitable nozzles.

3.5 MOISTURE AND MOLD CONTROL

- A. Contractor's Moisture-Protection Plan: Avoid trapping water in finished work. Document visible signs of mold that may appear during construction.
- B. Exposed Construction Phase: Before installation of weather barriers, when materials are subject to wetting and exposure and to airborne mold spores, protect as follows:
 1. Protect porous materials from water damage.
 2. Protect stored and installed material from flowing or standing water.
 3. Keep porous and organic materials from coming into prolonged contact with concrete.
 4. Remove standing water from decks.
 5. Keep deck openings covered or dammed.
- C. Partially Enclosed Construction Phase: After installation of weather barriers but before full enclosure and conditioning of building, when installed materials are still subject to infiltration of moisture and ambient mold spores, protect as follows:
 1. Do not load or install drywall or other porous materials or components, or items with high organic content, into partially enclosed building.
 2. Keep interior spaces reasonably clean and protected from water damage.
 3. Periodically collect and remove waste containing cellulose or other organic matter.
 4. Discard or replace water-damaged material.
 5. Do not install material that is wet.
 6. Discard, replace or clean stored or installed material that begins to grow mold.
 7. Perform work in a sequence that allows any wet materials adequate time to dry before enclosing the material in drywall or other interior finishes.
- D. Controlled Construction Phase of Construction: After completing and sealing of the building enclosure but prior to the full operation of permanent HVAC systems, maintain as follows:
 1. Control moisture and humidity inside building by maintaining effective dry-in conditions.
 2. Use permanent HVAC system to control humidity.
 3. Comply with manufacturer's written instructions for temperature, relative humidity, and exposure to water limits.
 - a. Hygroscopic materials that may support mold growth, including wood and gypsum-based products, that become wet during the course of construction and remain wet for 48 hours are considered defective.

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- b. Measure moisture content of materials that have been exposed to moisture during construction operations or after installation. Record daily readings over a forty-eight hour period. Identify materials containing moisture levels higher than allowed. Report findings in writing to Architect.
- c. Remove materials that can not be completely restored to their manufactured moisture level within 48 hours.

3.6 OPERATION, TERMINATION, AND REMOVAL

- A. Supervision: Enforce strict discipline in use of temporary facilities. To minimize waste and abuse, limit availability of temporary facilities to essential and intended uses.
- B. Maintenance: Maintain facilities in good operating condition until removal.
 - 1. Maintain operation of temporary enclosures, heating, cooling, humidity control, ventilation, and similar facilities on a 24-hour basis where required to achieve indicated results and to avoid possibility of damage.
- C. Temporary Facility Changeover: Do not change over from using temporary security and protection facilities to permanent facilities until Substantial Completion.
- D. Termination and Removal: Remove each temporary facility when need for its service has ended, when it has been replaced by authorized use of a permanent facility, or no later than Substantial Completion. Complete or, if necessary, restore permanent construction that may have been delayed because of interference with temporary facility. Repair damaged Work, clean exposed surfaces, and replace construction that cannot be satisfactorily repaired.
 - 1. Materials and facilities that constitute temporary facilities are property of Contractor. Owner reserves right to take possession of Project identification signs.
 - 2. Remove temporary roads and paved areas not intended for or acceptable for integration into permanent construction. Where area is intended for landscape development, remove soil and aggregate fill that do not comply with requirements for fill or subsoil. Remove materials contaminated with road oil, asphalt and other petrochemical compounds, and other substances that might impair growth of plant materials or lawns. Repair or replace street paving, curbs, and sidewalks at temporary entrances, as required by authorities having jurisdiction.
 - 3. At Substantial Completion, repair, renovate, and clean permanent facilities used during construction period. Comply with final cleaning requirements specified in Division 01 Section "Closeout Procedures."

END OF SECTION 015000

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SECTION 016000 - PRODUCT REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes administrative and procedural requirements for selection of products for use in Project; product delivery, storage, and handling; manufacturers' standard warranties on products; special warranties; and comparable products.
- B. Related Sections:
 - 1. Division 01 Section "Substitution Procedures" for requests for substitutions.

1.3 DEFINITIONS

- A. Products: Items obtained for incorporating into the Work, whether purchased for Project or taken from previously purchased stock. The term "product" includes the terms "material," "equipment," "system," and terms of similar intent.
 - 1. Named Products: Items identified by manufacturer's product name, including make or model number or other designation shown or listed in manufacturer's published product literature, that is current as of date of the Contract Documents.
 - 2. New Products: Items that have not previously been incorporated into another project or facility. Products salvaged or recycled from other projects are not considered new products.
 - 3. Comparable Product: Product that is demonstrated and approved through submittal process to have the indicated qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics that equal or exceed those of specified product.
- B. Basis-of-Design Product Specification: A specification in which a specific manufacturer's product is named and accompanied by the words "basis-of-design product," including make or model number or other designation, to establish the significant qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics for purposes of evaluating comparable products of additional manufacturers named in the specification.

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1.4 ACTION SUBMITTALS

- A. Comparable Product Requests: Submit request for consideration of each comparable product. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.
1. Include data to indicate compliance with the requirements specified in "Comparable Products" Article.
 2. Architect's Action: If necessary, Architect will request additional information or documentation for evaluation within one week of receipt of a comparable product request. Architect will notify Contractor of approval or rejection of proposed comparable product request within 10 business days of receipt of request, or five business days of receipt of additional information or documentation, whichever is later.
 - a. Use product specified if Architect does not issue a decision on use of a comparable product request within time allocated.
- B. Basis-of-Design Product Specification Submittal: Comply with requirements in Division 01 Section "Submittal Procedures." Show compliance with requirements.

1.5 QUALITY ASSURANCE

- A. Compatibility of Options: If Contractor is given option of selecting between two or more products for use on Project, select product compatible with products previously selected, even if previously selected products were also options.
1. Each contractor is responsible for providing products and construction methods compatible with products and construction methods of other contractors.
 2. If a dispute arises between contractors over concurrently selectable but incompatible products, Architect will determine which products shall be used.

1.6 PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, and handle products using means and methods that will prevent damage, deterioration, and loss, including theft and vandalism. Comply with manufacturer's written instructions.
- B. Delivery and Handling:
1. Schedule delivery to minimize long-term storage at Project site and to prevent overcrowding of construction spaces.
 2. Coordinate delivery with installation time to ensure minimum holding time for items that are flammable, hazardous, easily damaged, or sensitive to deterioration, theft, and other losses.
 3. Deliver products to Project site in an undamaged condition in manufacturer's original sealed container or other packaging system, complete with labels and instructions for handling, storing, unpacking, protecting, and installing.

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4. Inspect products on delivery to determine compliance with the Contract Documents and to determine that products are undamaged and properly protected.

C. Storage:

1. Store products to allow for inspection and measurement of quantity or counting of units.
2. Store materials in a manner that will not endanger Project structure.
3. Store products that are subject to damage by the elements, under cover in a weathertight enclosure above ground, with ventilation adequate to prevent condensation.
4. Store foam plastic from exposure to sunlight, except to extent necessary for period of installation and concealment.
5. Comply with product manufacturer's written instructions for temperature, humidity, ventilation, and weather-protection requirements for storage.
6. Protect stored products from damage and liquids from freezing.
7. Provide a secure location and enclosure at Project site for storage of materials and equipment by Owner's construction forces. Coordinate location with Owner.

1.7 PRODUCT WARRANTIES

- A. Warranties specified in other Sections shall be in addition to, and run concurrent with, other warranties required by the Contract Documents. Manufacturer's disclaimers and limitations on product warranties do not relieve Contractor of obligations under requirements of the Contract Documents.

1. Manufacturer's Warranty: Written warranty furnished by individual manufacturer for a particular product and specifically endorsed by manufacturer to Owner.
2. Special Warranty: Written warranty required by the Contract Documents to provide specific rights for Owner.

- B. Special Warranties: Prepare a written document that contains appropriate terms and identification, ready for execution.

1. Manufacturer's Standard Form: Modified to include Project-specific information and properly executed.
2. Specified Form: When specified forms are included with the Specifications, prepare a written document using indicated form properly executed.
3. Refer to Divisions 02 through 49. Sections for specific content requirements and particular requirements for submitting special warranties.

- C. Submittal Time: Comply with requirements in Division 01 Section "Closeout Procedures."

PART 2 - PRODUCTS

2.1 PRODUCT SELECTION PROCEDURES

- A. General Product Requirements: Provide products that comply with the Contract Documents, are undamaged and, unless otherwise indicated, are new at time of installation.
1. Provide products complete with accessories, trim, finish, fasteners, and other items needed for a complete installation and indicated use and effect.
 2. Standard Products: If available, and unless custom products or nonstandard options are specified, provide standard products of types that have been produced and used successfully in similar situations on other projects.
 3. Owner reserves the right to limit selection to products with warranties not in conflict with requirements of the Contract Documents.
 4. Where products are accompanied by the term "as selected," Architect will make selection.
 5. Descriptive, performance, and reference standard requirements in the Specifications establish salient characteristics of products.
 6. Or Equal: For products specified by name and accompanied by the term "or equal," or "or approved equal," or "or approved," comply with requirements in "Comparable Products" Article to obtain approval for use of an unnamed product.
- B. Product Selection Procedures:
1. Product: Where Specifications name a single manufacturer and product, provide the named product that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered.
 2. Manufacturer/Source: Where Specifications name a single manufacturer or source, provide a product by the named manufacturer or source that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered.
 3. Products:
 - a. Restricted List: Where Specifications include a list of names of both manufacturers and products, provide one of the products listed that complies with requirements.
 - b. Nonrestricted List: Where Specifications include a list of names of both available manufacturers and products, provide one of the products listed, or an unnamed product, that complies with requirements. Comply with requirements in "Comparable Products" Article for consideration of an unnamed product.
 4. Manufacturers:
 - a. Restricted List: Where Specifications include a list of manufacturers' names, provide a product by one of the manufacturers listed that complies with requirements.
 - b. Nonrestricted List: Where Specifications include a list of available manufacturers, provide a product by one of the manufacturers listed, or a product by an unnamed

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manufacturer, that complies with requirements. Comply with requirements in "Comparable Products" Article for consideration of an unnamed manufacturer's product.

5. Basis-of-Design Product: Where Specifications name a product, or refer to a product indicated on Drawings, and include a list of manufacturers, provide the specified or indicated product or a comparable product by one of the other named manufacturers. Drawings and Specifications indicate sizes, profiles, dimensions, and other characteristics that are based on the product named. Comply with requirements in "Comparable Products" Article for consideration of an unnamed product by one of the other named manufacturers.
- C. Visual Matching Specification: Where Specifications require "match Architect's sample", provide a product that complies with requirements and matches Architect's sample. Architect's decision will be final on whether a proposed product matches.
1. If no product available within specified category matches and complies with other specified requirements, comply with requirements in Division 01 Section "Substitution Procedures" for proposal of product.
- D. Visual Selection Specification: Where Specifications include the phrase "as selected by Architect from manufacturer's full range" or similar phrase, select a product that complies with requirements. Architect will select color, gloss, pattern, density, or texture from manufacturer's product line that includes both standard and premium items.

2.2 COMPARABLE PRODUCTS

- A. Conditions for Consideration: Architect will consider Contractor's request for comparable product when the following conditions are satisfied. If the following conditions are not satisfied, Architect may return requests without action, except to record noncompliance with these requirements:
1. Evidence that the proposed product does not require revisions to the Contract Documents, that it is consistent with the Contract Documents and will produce the indicated results, and that it is compatible with other portions of the Work.
 2. Detailed comparison of significant qualities of proposed product with those named in the Specifications. Significant qualities include attributes such as performance, weight, size, durability, visual effect, and specific features and requirements indicated.
 3. Evidence that proposed product provides specified warranty.
 4. List of similar installations for completed projects with project names and addresses and names and addresses of architects and owners, if requested.
 5. Samples, if requested.

PART 3 - EXECUTION (Not Used)

END OF SECTION 016000

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SECTION 017300 - EXECUTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes general administrative and procedural requirements governing execution of the Work including, but not limited to, the following:

1. Construction layout.
2. Field engineering and surveying.
3. Installation of the Work.
4. Cutting and patching.
5. Progress cleaning.
6. Starting and adjusting.
7. Protection of installed construction.
8. Correction of the Work.

- B. Related Sections:

1. Division 01 Section "Submittal Procedures" for submitting surveys.
2. Division 01 Section "Closeout Procedures" for submitting final property survey with Project Record Documents, recording of Owner-accepted deviations from indicated lines and levels, and final cleaning.
3. Division 02 Section "Selective Structure Demolition" for demolition and removal of selected portions of the building.

1.3 DEFINITIONS

- A. Cutting: Removal of in-place construction necessary to permit installation or performance of other work.
- B. Patching: Fitting and repair work required to restore construction to original conditions after installation of other work.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For land surveyor.

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- B. Certificates: Submit certificate signed by land surveyor certifying that location and elevation of improvements comply with requirements.
- C. Cutting and Patching Plan: Submit plan describing procedures at least 10 days prior to the time cutting and patching will be performed. Include the following information:
 - 1. Extent: Describe reason for and extent of each occurrence of cutting and patching.
 - 2. Changes to In-Place Construction: Describe anticipated results. Include changes to structural elements and operating components as well as changes in building appearance and other significant visual elements.
 - 3. Products: List products to be used for patching and firms or entities that will perform patching work.
 - 4. Dates: Indicate when cutting and patching will be performed.
 - 5. Utilities and Mechanical and Electrical Systems: List services and systems that cutting and patching procedures will disturb or affect. List services and systems that will be relocated and those that will be temporarily out of service. Indicate how long services and systems will be disrupted.
- D. Certified Surveys: Submit two copies signed by land surveyor.

1.5 QUALITY ASSURANCE

- A. Land Surveyor Qualifications: A professional land surveyor who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing land-surveying services of the kind indicated.
- B. Cutting and Patching: Comply with requirements for and limitations on cutting and patching of construction elements.
 - 1. Structural Elements: When cutting and patching structural elements, notify Architect of locations and details of cutting and await directions from the Architect before proceeding. Shore, brace, and support structural element during cutting and patching. Do not cut and patch structural elements in a manner that could change their load-carrying capacity or increase deflection
 - 2. Operational Elements: Do not cut and patch operating elements and related components in a manner that results in reducing their capacity to perform as intended or that results in increased maintenance or decreased operational life or safety.
 - a. Primary operational systems and equipment.
 - b. Fire separation assemblies.
 - c. Air or smoke barriers.
 - d. Fire-suppression systems.
 - e. Mechanical systems piping and ducts.
 - f. Control systems.
 - g. Communication systems.
 - h. Conveying systems.
 - i. Electrical wiring systems.

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- j. Operating systems of special construction.
 - 3. Other Construction Elements: Do not cut and patch other construction elements or components in a manner that could change their load-carrying capacity, that results in reducing their capacity to perform as intended, or that results in increased maintenance or decreased operational life or safety.
 - a. Water, moisture, or vapor barriers.
 - b. Membranes and flashings.
 - c. Exterior curtain-wall construction.
 - d. Equipment supports.
 - e. Piping, ductwork, vessels, and equipment.
 - f. Noise- and vibration-control elements and systems.
 - 4. Visual Elements: Do not cut and patch construction in a manner that results in visual evidence of cutting and patching. Do not cut and patch exposed construction in a manner that would, in Architect's opinion, reduce the building's aesthetic qualities. Remove and replace construction that has been cut and patched in a visually unsatisfactory manner.
 - C. Cutting and Patching Conference: Before proceeding, meet at Project site with parties involved in cutting and patching, including mechanical and electrical trades. Review areas of potential interference and conflict. Coordinate procedures and resolve potential conflicts before proceeding.
 - D. Manufacturer's Installation Instructions: Obtain and maintain on-site manufacturer's written recommendations and instructions for installation of products and equipment.
- 1.6 WARRANTY
- A. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during installation or cutting and patching operations, by methods and with materials so as not to void existing warranties.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. General: Comply with requirements specified in other Sections.
- B. In-Place Materials: Use materials for patching identical to in-place materials. For exposed surfaces, use materials that visually match in-place adjacent surfaces to the fullest extent possible.
 - 1. If identical materials are unavailable or cannot be used, use materials that, when installed, will provide a match acceptable to the Architect for the visual and functional performance of in-place materials.

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PART 3 - EXECUTION

3.1 EXAMINATION

- A. Existing Conditions: The existence and location of underground and other utilities and construction indicated as existing are not guaranteed. Before beginning sitework, investigate and verify the existence and location of underground utilities, mechanical and electrical systems, and other construction affecting the Work.
1. Before construction, verify the location and invert elevation at points of connection of sanitary sewer, storm sewer, and water-service piping; underground electrical services, and other utilities.
 2. Furnish location data for work related to Project that must be performed by public utilities serving Project site.
- B. Examination and Acceptance of Conditions: Before proceeding with each component of the Work, examine substrates, areas, and conditions, with Installer or Applicator present where indicated, for compliance with requirements for installation tolerances and other conditions affecting performance. Record observations.
1. Written Report: Where a written report listing conditions detrimental to performance of the Work is required by other Sections, include the following:
 - a. Description of the Work.
 - b. List of detrimental conditions, including substrates.
 - c. List of unacceptable installation tolerances.
 - d. Recommended corrections.
 2. Verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.
 3. Examine roughing-in for mechanical and electrical systems to verify actual locations of connections before equipment and fixture installation.
 4. Examine walls, floors, and roofs for suitable conditions where products and systems are to be installed.
 5. Proceed with installation only after unsatisfactory conditions have been corrected. Proceeding with the Work indicates acceptance of surfaces and conditions.

3.2 PREPARATION

- A. Existing Utility Information: Furnish information to local utility and Owner that is necessary to adjust, move, or relocate existing utility structures, utility poles, lines, services, or other utility appurtenances located in or affected by construction. Coordinate with authorities having jurisdiction.
- B. Field Measurements: Take field measurements as required to fit the Work properly. Recheck measurements before installing each product. Where portions of the Work are indicated to fit to other construction, verify dimensions of other construction by field measurements before

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fabrication. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

- C. Space Requirements: Verify space requirements and dimensions of items shown diagrammatically on Drawings.
- D. Review of Contract Documents and Field Conditions: Immediately on discovery of the need for clarification of the Contract Documents caused by differing field conditions outside the control of the Contractor, submit a request for information to Architect according to requirements in Division 01 Section "Project Management and Coordination."

3.3 CONSTRUCTION LAYOUT

- A. Verification: Before proceeding to lay out the Work, verify layout information shown on Drawings, in relation to the property survey and existing benchmarks. If discrepancies are discovered, notify Architect promptly.
- B. General: Engage a land surveyor to lay out the Work using accepted surveying practices.
 - 1. Establish benchmarks and control points to set lines and levels at each story of construction and elsewhere as needed to locate each element of Project.
 - 2. Establish dimensions within tolerances indicated. Do not scale Drawings to obtain required dimensions.
 - 3. Inform installers of lines and levels to which they must comply.
 - 4. Check the location, level and plumb, of every major element as the Work progresses.
 - 5. Notify Architect when deviations from required lines and levels exceed allowable tolerances.
 - 6. Close site surveys with an error of closure equal to or less than the standard established by authorities having jurisdiction.
- C. Site Improvements: Locate and lay out site improvements, including pavements, grading, fill and topsoil placement, utility slopes, and rim and invert elevations.
- D. Building Lines and Levels: Locate and lay out control lines and levels for structures, building foundations, column grids, and floor levels, including those required for mechanical and electrical work. Transfer survey markings and elevations for use with control lines and levels. Level foundations and piers from two or more locations.
- E. Record Log: Maintain a log of layout control work. Record deviations from required lines and levels. Include beginning and ending dates and times of surveys, weather conditions, name and duty of each survey party member, and types of instruments and tapes used. Make the log available for reference by Architect when requested.

3.4 FIELD ENGINEERING

- A. Identification: Owner will identify existing benchmarks, control points, and property corners.

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- B. Reference Points: Locate existing permanent benchmarks, control points, and similar reference points before beginning the Work. Preserve and protect permanent benchmarks and control points during construction operations.
 - 1. Do not change or relocate existing benchmarks or control points without prior written approval of Architect. Report lost or destroyed permanent benchmarks or control points promptly. Report the need to relocate permanent benchmarks or control points to Architect before proceeding.
 - 2. Replace lost or destroyed permanent benchmarks and control points promptly. Base replacements on the original survey control points.
- C. Benchmarks: Establish and maintain a minimum of two permanent benchmarks on Project site, referenced to data established by survey control points. Comply with authorities having jurisdiction for type and size of benchmark.
 - 1. Record benchmark locations, with horizontal and vertical data, on Project Record Documents.
 - 2. Where the actual location or elevation of layout points cannot be marked, provide temporary reference points sufficient to locate the Work.
 - 3. Remove temporary reference points when no longer needed. Restore marked construction to its original condition.
- D. Certified Survey: On completion of foundation walls, major site improvements, and other work requiring field-engineering services, prepare a certified survey showing dimensions, locations, angles, and elevations of construction and sitework.

3.5 INSTALLATION

- A. General: Locate the Work and components of the Work accurately, in correct alignment and elevation, as indicated.
 - 1. Make vertical work plumb and make horizontal work level.
 - 2. Where space is limited, install components to maximize space available for maintenance and ease of removal for replacement.
 - 3. Conceal pipes, ducts, and wiring in finished areas, unless otherwise indicated.
 - 4. Maintain minimum headroom clearance of 96 inches (2440 mm) in occupied spaces and 90 inches (2300 mm) in unoccupied spaces.
- B. Comply with manufacturer's written instructions and recommendations for installing products in applications indicated.
- C. Install products at the time and under conditions that will ensure the best possible results. Maintain conditions required for product performance until Substantial Completion.
- D. Conduct construction operations so no part of the Work is subjected to damaging operations or loading in excess of that expected during normal conditions of occupancy.
- E. Tools and Equipment: Do not use tools or equipment that produce harmful noise levels.

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- F. Templates: Obtain and distribute to the parties involved templates for work specified to be factory prepared and field installed. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing products to comply with indicated requirements.
- G. Attachment: Provide blocking and attachment plates and anchors and fasteners of adequate size and number to securely anchor each component in place, accurately located and aligned with other portions of the Work. Where size and type of attachments are not indicated, verify size and type required for load conditions.
 - 1. Mounting Heights: Where mounting heights are not indicated, mount components at heights directed by Architect.
 - 2. Allow for building movement, including thermal expansion and contraction.
 - 3. Coordinate installation of anchorages. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.
- H. Joints: Make joints of uniform width. Where joint locations in exposed work are not indicated, arrange joints for the best visual effect. Fit exposed connections together to form hairline joints.
- I. Hazardous Materials: Use products, cleaners, and installation materials that are not considered hazardous.

3.6 CUTTING AND PATCHING

- A. Cutting and Patching, General: Employ skilled workers to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time, and complete without delay.
 - 1. Cut in-place construction to provide for installation of other components or performance of other construction, and subsequently patch as required to restore surfaces to their original condition.
- B. Temporary Support: Provide temporary support of work to be cut.
- C. Protection: Protect in-place construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of Project that might be exposed during cutting and patching operations.
- D. Adjacent Occupied Areas: Where interference with use of adjoining areas or interruption of free passage to adjoining areas is unavoidable, coordinate cutting and patching in accordance with requirements of Division 01 Section "Summary."
- E. Existing Utility Services and Mechanical/Electrical Systems: Where existing services/systems are required to be removed, relocated, or abandoned, bypass such services/systems before cutting to prevent interruption to occupied areas.

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- F. Cutting: Cut in-place construction by sawing, drilling, breaking, chipping, grinding, and similar operations, including excavation, using methods least likely to damage elements retained or adjoining construction. If possible, review proposed procedures with original Installer; comply with original Installer's written recommendations.
1. In general, use hand or small power tools designed for sawing and grinding, not hammering and chopping. Cut holes and slots neatly to minimum size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.
 2. Finished Surfaces: Cut or drill from the exposed or finished side into concealed surfaces.
 3. Concrete and Masonry: Cut using a cutting machine, such as an abrasive saw or a diamond-core drill.
 4. Excavating and Backfilling: Comply with requirements in applicable Division 31 Sections where required by cutting and patching operations.
 5. Mechanical and Electrical Services: Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit to prevent entrance of moisture or other foreign matter after cutting.
 6. Proceed with patching after construction operations requiring cutting are complete.
- G. Patching: Patch construction by filling, repairing, refinishing, closing up, and similar operations following performance of other work. Patch with durable seams that are as invisible as practicable. Provide materials and comply with installation requirements specified in other Sections, where applicable.
1. Inspection: Where feasible, test and inspect patched areas after completion to demonstrate physical integrity of installation.
 2. Exposed Finishes: Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will minimize evidence of patching and refinishing.
 - a. Clean piping, conduit, and similar features before applying paint or other finishing materials.
 - b. Restore damaged pipe covering to its original condition.
 3. Floors and Walls: Where walls or partitions that are removed extend one finished area into another, patch and repair floor and wall surfaces in the new space. Provide an even surface of uniform finish, color, texture, and appearance. Remove in-place floor and wall coverings and replace with new materials, if necessary, to achieve uniform color and appearance.
 - a. Where patching occurs in a painted surface, prepare substrate and apply primer and intermediate paint coats appropriate for substrate over the patch, and apply final paint coat over entire unbroken surface containing the patch. Provide additional coats until patch blends with adjacent surfaces.
 4. Ceilings: Patch, repair, or rehang in-place ceilings as necessary to provide an even-plane surface of uniform appearance.
 5. Exterior Building Enclosure: Patch components in a manner that restores enclosure to a weathertight condition.

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- H. Cleaning: Clean areas and spaces where cutting and patching are performed. Remove paint, mortar, oils, putty, and similar materials from adjacent finished surfaces.

3.7 PROGRESS CLEANING

- A. General: Clean Project site and work areas daily, including common areas. Enforce requirements strictly. Dispose of materials lawfully.
 - 1. Comply with requirements in NFPA 241 for removal of combustible waste materials and debris.
 - 2. Do not hold waste materials more than seven days during normal weather or three days if the temperature is expected to rise above 80 deg F (27 deg C).
 - 3. Containerize hazardous and unsanitary waste materials separately from other waste. Mark containers appropriately and dispose of legally, according to regulations.
 - a. Utilize containers intended for holding waste materials of type to be stored.
 - 4. Coordinate progress cleaning for joint-use areas where more than one installer has worked.
- B. Site: Maintain Project site free of waste materials and debris.
- C. Work Areas: Clean areas where work is in progress to the level of cleanliness necessary for proper execution of the Work.
 - 1. Remove liquid spills promptly.
 - 2. Where dust would impair proper execution of the Work, broom-clean or vacuum the entire work area, as appropriate.
- D. Installed Work: Keep installed work clean. Clean installed surfaces according to written instructions of manufacturer or fabricator of product installed, using only cleaning materials specifically recommended. If specific cleaning materials are not recommended, use cleaning materials that are not hazardous to health or property and that will not damage exposed surfaces.
- E. Concealed Spaces: Remove debris from concealed spaces before enclosing the space.
- F. Exposed Surfaces in Finished Areas: Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.
- G. Waste Disposal: Do not bury or burn waste materials on-site. Do not wash waste materials down sewers or into waterways. Comply with waste disposal requirements in Division 01 Section "Temporary Facilities and Controls."
- H. During handling and installation, clean and protect construction in progress and adjoining materials already in place. Apply protective covering where required to ensure protection from damage or deterioration at Substantial Completion.

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- I. Clean and provide maintenance on completed construction as frequently as necessary through the remainder of the construction period. Adjust and lubricate operable components to ensure operability without damaging effects.
- J. Limiting Exposures: Supervise construction operations to assure that no part of the construction, completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period.

3.8 STARTING AND ADJUSTING

- A. Coordinate startup and adjusting of equipment and operating components with requirements in Division 01 Section "General Commissioning Requirements."
- B. Start equipment and operating components to confirm proper operation. Remove malfunctioning units, replace with new units, and retest.
- C. Adjust equipment for proper operation. Adjust operating components for proper operation without binding.
- D. Test each piece of equipment to verify proper operation. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- E. Manufacturer's Field Service: Comply with qualification requirements in Division 01 Section "Quality Requirements."

3.9 PROTECTION OF INSTALLED CONSTRUCTION

- A. Provide final protection and maintain conditions that ensure installed Work is without damage or deterioration at time of Substantial Completion.
- B. Comply with manufacturer's written instructions for temperature and relative humidity.

3.10 CORRECTION OF THE WORK

- A. Repair or remove and replace defective construction. Restore damaged substrates and finishes.
 - 1. Repairing includes replacing defective parts, refinishing damaged surfaces, touching up with matching materials, and properly adjusting operating equipment.
- B. Restore permanent facilities used during construction to their specified condition.
- C. Remove and replace damaged surfaces that are exposed to view if surfaces cannot be repaired without visible evidence of repair.
- D. Repair components that do not operate properly. Remove and replace operating components that cannot be repaired.

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- E. Remove and replace chipped, scratched, and broken glass or reflective surfaces.

END OF SECTION 017300

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SECTION 017700 - CLOSEOUT PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes administrative and procedural requirements for contract closeout, including, but not limited to, the following:
 - 1. Substantial Completion procedures.
 - 2. Final completion procedures.
 - 3. Warranties.
 - 4. Final cleaning.
- B. Related Sections:
 - 1. Division 01 Section "Execution" for progress cleaning of Project site.
 - 2. Division 01 Section "Operation and Maintenance Data" for operation and maintenance manual requirements.
 - 3. Division 01 Section "Project Record Documents" for submitting Record Drawings, Record Specifications, and Record Product Data.
 - 4. Division 01 Section "Demonstration and Training" for requirements for instructing Owner's personnel.
 - 5. Divisions 02 through 49 Sections for specific closeout and special cleaning requirements for the Work in those Sections.

1.3 SUBSTANTIAL COMPLETION

- A. Preliminary Procedures: Before requesting inspection for determining date of Substantial Completion, complete the following. List items below that are incomplete with request.
 - 1. Prepare a list of items to be completed and corrected (punch list), the value of items on the list, and reasons why the Work is not complete.
 - 2. Advise Owner of pending insurance changeover requirements.
 - 3. Submit specific warranties, workmanship bonds, maintenance service agreements, final certifications, and similar documents.
 - 4. Obtain and submit releases permitting Owner unrestricted use of the Work and access to services and utilities. Include occupancy permits, operating certificates, and similar releases.

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5. Prepare and submit Project Record Documents, operation and maintenance manuals, final completion construction photographic documentation, damage or settlement surveys, property surveys, and similar final record information.
6. Deliver tools, spare parts, extra materials, and similar items to location designated by Owner. Label with manufacturer's name and model number where applicable.
7. Make final changeover of permanent locks and deliver keys to Owner. Advise Owner's personnel of changeover in security provisions.
8. Complete startup testing of systems.
9. Submit test/adjust/balance records.
10. Terminate and remove temporary facilities from Project site, along with mockups, construction tools, and similar elements.
11. Advise Owner of changeover in heat and other utilities.
12. Submit changeover information related to Owner's occupancy, use, operation, and maintenance.
13. Complete final cleaning requirements, including touchup painting.
14. Touch up and otherwise repair and restore marred exposed finishes to eliminate visual defects.

B. Inspection: Submit a written request for inspection for Substantial Completion. On receipt of request, Architect will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare the Certificate of Substantial Completion after inspection or will notify Contractor of items, either on Contractor's list or additional items identified by Architect, that must be completed or corrected before certificate will be issued.

1. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.
2. Results of completed inspection will form the basis of requirements for final completion.

1.4 FINAL COMPLETION

A. Preliminary Procedures: Before requesting final inspection for determining final completion, complete the following:

1. Submit a final Application for Payment according to Division 01 Section "Payment Procedures."
2. Submit certified copy of Architect's Substantial Completion inspection list of items to be completed or corrected (punch list), endorsed and dated by Architect. The certified copy of the list shall state that each item has been completed or otherwise resolved for acceptance.
3. Submit evidence of final, continuing insurance coverage complying with insurance requirements.
4. Submit pest-control final inspection report and warranty.
5. Instruct Owner's personnel in operation, adjustment, and maintenance of products, equipment, and systems.

B. Inspection: Submit a written request for final inspection for acceptance. On receipt of request, Architect will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare a final Certificate for Payment after inspection or will notify Contractor of construction that must be completed or corrected before certificate will be issued.

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1. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.

1.5 LIST OF INCOMPLETE ITEMS (PUNCH LIST)

- A. Organization of List: Include name and identification of each space and area affected by construction operations for incomplete items and items needing correction including, if necessary, areas disturbed by Contractor that are outside the limits of construction.
 1. Organize list of spaces in sequential order.
 2. Organize items applying to each space by major element, including categories for ceiling, individual walls, floors, equipment, and building systems.
 3. Include the following information at the top of each page:
 - a. Project name.
 - b. Date.
 - c. Name of Architect.
 - d. Name of Contractor.
 - e. Page number.
 4. Submit list of incomplete items in the following format:
 - a. PDF electronic file.
 - b. Three paper copies of product schedule or list, unless otherwise indicated. Architect, will return two copies.

1.6 WARRANTIES

- A. Submittal Time: Submit written warranties on request of Architect for designated portions of the Work where commencement of warranties other than date of Substantial Completion is indicated.
- B. Partial Occupancy: Submit properly executed warranties within 15 days of completion of designated portions of the Work that are completed and occupied or used by Owner during construction period by separate agreement with Contractor.
- C. Organize warranty documents into an orderly sequence based on the table of contents of the Project Manual.
 1. Bind warranties and bonds in heavy-duty, three-ring, vinyl-covered, loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8-1/2-by-11-inch (215-by-280-mm) paper.
 2. Provide heavy paper dividers with plastic-covered tabs for each separate warranty. Mark tab to identify the product or installation. Provide a typed description of the product or installation, including the name of the product and the name, address, and telephone number of Installer.
 3. Identify each binder on the front and spine with the typed or printed title "WARRANTIES," Project name, and name of Contractor.

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4. Scan warranties and bonds and assemble complete warranty and bond submittal package into a single indexed electronic PDF file with links enabling navigation to each item. Provide table of contents at beginning of document.
- D. Provide additional copies of each warranty to include in operation and maintenance manuals.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Cleaning Agents: Use cleaning materials and agents recommended by manufacturer or fabricator of the surface to be cleaned. Do not use cleaning agents that are potentially hazardous to health or property or that might damage finished surfaces.
 1. Use cleaning products that meet Green Seal GS-37, or if GS-37 is not applicable, use products that comply with the California Code of Regulations maximum allowable VOC levels.

PART 3 - EXECUTION

3.1 FINAL CLEANING

- A. General: Perform final cleaning. Conduct cleaning and waste-removal operations to comply with local laws and ordinances and Federal and local environmental and antipollution regulations.
- B. Cleaning: Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to condition expected in an average commercial building cleaning and maintenance program. Comply with manufacturer's written instructions.
 1. Complete the following cleaning operations before requesting inspection for certification of Substantial Completion for entire Project or for a portion of Project:
 - a. Clean Project site, yard, and grounds, in areas disturbed by construction activities, including landscape development areas, of rubbish, waste material, litter, and other foreign substances.
 - b. Sweep paved areas broom clean. Remove petrochemical spills, stains, and other foreign deposits.
 - c. Rake grounds that are neither planted nor paved to a smooth, even-textured surface.
 - d. Remove tools, construction equipment, machinery, and surplus material from Project site.
 - e. Remove snow and ice to provide safe access to building.
 - f. Clean exposed exterior and interior hard-surfaced finishes to a dirt-free condition, free of stains, films, and similar foreign substances. Avoid disturbing natural weathering of exterior surfaces. Restore reflective surfaces to their original condition.

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- g. Remove debris and surface dust from limited access spaces, including roofs, plenums, shafts, trenches, equipment vaults, manholes, attics, and similar spaces.
 - h. Sweep concrete floors broom clean in unoccupied spaces.
 - i. Vacuum carpet and similar soft surfaces, removing debris and excess nap; shampoo if visible soil or stains remain.
 - j. Clean transparent materials, including mirrors and glass in doors and windows. Remove glazing compounds and other noticeable, vision-obscuring materials. Replace chipped or broken glass and other damaged transparent materials. Polish mirrors and glass, taking care not to scratch surfaces.
 - k. Remove labels that are not permanent.
 - l. Touch up and otherwise repair and restore marred, exposed finishes and surfaces. Replace finishes and surfaces that cannot be satisfactorily repaired or restored or that already show evidence of repair or restoration.
 - 1) Do not paint over "UL" and other required labels and identification, including mechanical and electrical nameplates.
 - m. Wipe surfaces of mechanical and electrical equipment, and similar equipment. Remove excess lubrication, paint and mortar droppings, and other foreign substances.
 - n. Replace parts subject to operating conditions during construction that may impede operation or reduce longevity.
 - o. Clean plumbing fixtures to a sanitary condition, free of stains, including stains resulting from water exposure.
 - p. Replace disposable air filters and clean permanent air filters. Clean exposed surfaces of diffusers, registers, and grills.
 - q. Clean ducts, blowers, and coils if units were operated without filters during construction or that display contamination with particulate matter upon inspection.
 - 1) Clean HVAC system in compliance with NADCA Standard 1992-01. Provide written report upon completion of cleaning.
 - r. Clean light fixtures, lamps, globes, and reflectors to function with full efficiency. Replace burned-out bulbs, and those noticeably dimmed by hours of use, and defective and noisy starters in fluorescent and mercury vapor fixtures to comply with requirements for new fixtures.
 - s. Leave Project clean and ready for occupancy.
- C. Pest Control: Engage an experienced, licensed exterminator to make a final inspection and rid Project of rodents, insects, and other pests. Prepare a report.
- D. Construction Waste Disposal: Comply with waste disposal requirements in Division 01 Section "Temporary Facilities and Controls."

END OF SECTION 017700

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SECTION 017823 - OPERATION AND MAINTENANCE DATA

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes administrative and procedural requirements for preparing operation and maintenance manuals, including the following:
 - 1. Operation and maintenance documentation directory.
 - 2. Emergency manuals.
 - 3. Operation manuals for systems, subsystems, and equipment.
 - 4. Maintenance manuals for the care and maintenance of products, materials, and finishes, systems, and equipment.
- B. Related Sections include the following:
 - 1. Division 01 Section "Submittal Procedures" for submitting copies of submittals for operation and maintenance manuals.
 - 2. Division 01 Section "Closeout Procedures" for submitting operation and maintenance manuals.
 - 3. Division 01 Section "Project Record Documents" for preparing Record Drawings for operation and maintenance manuals.
 - 4. Divisions 02 through 49 Sections for specific operation and maintenance manual requirements for the Work in those Sections.

1.3 DEFINITIONS

- A. System: An organized collection of parts, equipment, or subsystems united by regular interaction.
- B. Subsystem: A portion of a system with characteristics similar to a system.

1.4 SUBMITTALS

- A. Initial Submittal: Submit 2 draft copies of each manual at least 15 days before requesting inspection for Substantial Completion. Include a complete operation and maintenance

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directory. Architect will return one copy of draft and mark whether general scope and content of manual are acceptable.

- B. Final Submittal: Submit one copy of each manual in final form at least 15 days before final inspection. Architect will return copy with comments within 15 days after final inspection.
 - 1. Correct or modify each manual to comply with Architect's comments. Submit 3 copies of each corrected manual within 15 days of receipt of Architect's comments.

1.5 COORDINATION

- A. Where operation and maintenance documentation includes information on installations by more than one factory-authorized service representative, assemble and coordinate information furnished by representatives and prepare manuals.

PART 2 - PRODUCTS

2.1 OPERATION AND MAINTENANCE DOCUMENTATION DIRECTORY

- A. Organization: Include a section in the directory for each of the following:
 - 1. List of documents.
 - 2. List of systems.
 - 3. List of equipment.
 - 4. Table of contents.
- B. List of Systems and Subsystems: List systems alphabetically. Include references to operation and maintenance manuals that contain information about each system.
- C. List of Equipment: List equipment for each system, organized alphabetically by system. For pieces of equipment not part of system, list alphabetically in separate list.
- D. Tables of Contents: Include a table of contents for each emergency, operation, and maintenance manual.
- E. Identification: In the documentation directory and in each operation and maintenance manual, identify each system, subsystem, and piece of equipment with same designation used in the Contract Documents. If no designation exists, assign a designation according to ASHRAE Guideline 4, "Preparation of Operating and Maintenance Documentation for Building Systems."

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2.2 MANUALS, GENERAL

- A. Organization: Unless otherwise indicated, organize each manual into a separate section for each system and subsystem, and a separate section for each piece of equipment not part of a system. Each manual shall contain the following materials, in the order listed:
1. Title page.
 2. Table of contents.
 3. Manual contents.
- B. Title Page: Enclose title page in transparent plastic sleeve. Include the following information:
1. Subject matter included in manual.
 2. Name and address of Project.
 3. Name and address of Owner.
 4. Date of submittal.
 5. Name, address, and telephone number of Contractor.
 6. Name and address of Architect.
 7. Cross-reference to related systems in other operation and maintenance manuals.
- C. Table of Contents: List each product included in manual, identified by product name, indexed to the content of the volume, and cross-referenced to Specification Section number in Project Manual.
1. If operation or maintenance documentation requires more than one volume to accommodate data, include comprehensive table of contents for all volumes in each volume of the set.
- D. Manual Contents: Organize into sets of manageable size. Arrange contents alphabetically by system, subsystem, and equipment. If possible, assemble instructions for subsystems, equipment, and components of one system into a single binder.
1. Binders: Heavy-duty, 3-ring, vinyl-covered, loose-leaf binders, in thickness necessary to accommodate contents, sized to hold 8-1/2-by-11-inch (215-by-280-mm) paper; with clear plastic sleeve on spine to hold label describing contents and with pockets inside covers to hold folded oversize sheets.
 - a. If two or more binders are necessary to accommodate data of a system, organize data in each binder into groupings by subsystem and related components. Cross-reference other binders if necessary to provide essential information for proper operation or maintenance of equipment or system.
 - b. Identify each binder on front and spine, with printed title "OPERATION AND MAINTENANCE MANUAL," Project title or name, and subject matter of contents. Indicate volume number for multiple-volume sets.
 2. Dividers: Heavy-paper dividers with plastic-covered tabs for each section. Mark each tab to indicate contents. Include typed list of products and major components of equipment included in the section on each divider, cross-referenced to Specification Section number and title of Project Manual.

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3. Protective Plastic Sleeves: Transparent plastic sleeves designed to enclose diagnostic software diskettes for computerized electronic equipment.
4. Supplementary Text: Prepared on 8-1/2-by-11-inch (215-by-280-mm) white bond paper.
5. Drawings: Attach reinforced, punched binder tabs on drawings and bind with text.
 - a. If oversize drawings are necessary, fold drawings to same size as text pages and use as foldouts.
 - b. If drawings are too large to be used as foldouts, fold and place drawings in labeled envelopes and bind envelopes in rear of manual. At appropriate locations in manual, insert typewritten pages indicating drawing titles, descriptions of contents, and drawing locations.

2.3 OPERATION MANUALS

- A. Content: In addition to requirements in this Section, include operation data required in individual Specification Sections and the following information:
 1. System, subsystem, and equipment descriptions.
 2. Performance and design criteria if Contractor is delegated design responsibility.
 3. Operating standards.
 4. Operating procedures.
 5. Operating logs.
 6. Wiring diagrams.
 7. Control diagrams.
 8. Piped system diagrams.
 9. Precautions against improper use.
 10. License requirements including inspection and renewal dates.
- B. Descriptions: Include the following:
 1. Product name and model number.
 2. Manufacturer's name.
 3. Equipment identification with serial number of each component.
 4. Equipment function.
 5. Operating characteristics.
 6. Limiting conditions.
 7. Performance curves.
 8. Engineering data and tests.
 9. Complete nomenclature and number of replacement parts.
- C. Operating Procedures: Include the following, as applicable:
 1. Startup procedures.
 2. Equipment or system break-in procedures.
 3. Routine and normal operating instructions.
 4. Regulation and control procedures.
 5. Instructions on stopping.
 6. Normal shutdown instructions.

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7. Seasonal and weekend operating instructions.
8. Required sequences for electric or electronic systems.
9. Special operating instructions and procedures.

- D. Systems and Equipment Controls: Describe the sequence of operation, and diagram controls as installed.
- E. Piped Systems: Diagram piping as installed, and identify color-coding where required for identification.

2.4 PRODUCT MAINTENANCE MANUAL

- A. Content: Organize manual into a separate section for each product, material, and finish. Include source information, product information, maintenance procedures, repair materials and sources, and warranties and bonds, as described below.
- B. Source Information: List each product included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual.
- C. Product Information: Include the following, as applicable:
1. Product name and model number.
 2. Manufacturer's name.
 3. Color, pattern, and texture.
 4. Material and chemical composition.
 5. Reordering information for specially manufactured products.
- D. Maintenance Procedures: Include manufacturer's written recommendations and the following:
1. Inspection procedures.
 2. Types of cleaning agents to be used and methods of cleaning.
 3. List of cleaning agents and methods of cleaning detrimental to product.
 4. Schedule for routine cleaning and maintenance.
 5. Repair instructions.
- E. Repair Materials and Sources: Include lists of materials and local sources of materials and related services.
- F. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.
1. Include procedures to follow and required notifications for warranty claims.

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2.5 SYSTEMS AND EQUIPMENT MAINTENANCE MANUAL

- A. Content: For each system, subsystem, and piece of equipment not part of a system, include source information, manufacturers' maintenance documentation, maintenance procedures, maintenance and service schedules, spare parts list and source information, maintenance service contracts, and warranty and bond information, as described below.
- B. Source Information: List each system, subsystem, and piece of equipment included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual.
- C. Manufacturers' Maintenance Documentation: Manufacturers' maintenance documentation including the following information for each component part or piece of equipment:
 - 1. Standard printed maintenance instructions and bulletins.
 - 2. Drawings, diagrams, and instructions required for maintenance, including disassembly and component removal, replacement, and assembly.
 - 3. Identification and nomenclature of parts and components.
 - 4. List of items recommended to be stocked as spare parts.
- D. Maintenance Procedures: Include the following information and items that detail essential maintenance procedures:
 - 1. Test and inspection instructions.
 - 2. Troubleshooting guide.
 - 3. Precautions against improper maintenance.
 - 4. Disassembly; component removal, repair, and replacement; and reassembly instructions.
 - 5. Aligning, adjusting, and checking instructions.
 - 6. Demonstration and training videotape, if available.
- E. Maintenance and Service Schedules: Include service and lubrication requirements, list of required lubricants for equipment, and separate schedules for preventive and routine maintenance and service with standard time allotment.
 - 1. Scheduled Maintenance and Service: Tabulate actions for daily, weekly, monthly, quarterly, semiannual, and annual frequencies.
 - 2. Maintenance and Service Record: Include manufacturers' forms for recording maintenance.
- F. Spare Parts List and Source Information: Include lists of replacement and repair parts, with parts identified and cross-referenced to manufacturers' maintenance documentation and local sources of maintenance materials and related services.
- G. Maintenance Service Contracts: Include copies of maintenance agreements with name and telephone number of service agent.
- H. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.

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1. Include procedures to follow and required notifications for warranty claims.

PART 3 - EXECUTION

3.1 MANUAL PREPARATION

- A. Operation and Maintenance Documentation Directory: Prepare a separate manual that provides an organized reference to emergency, operation, and maintenance manuals.
- B. Emergency Manual: Assemble a complete set of emergency information indicating procedures for use by emergency personnel and by Owner's operating personnel for types of emergencies indicated.
- C. Product Maintenance Manual: Assemble a complete set of maintenance data indicating care and maintenance of each product, material, and finish incorporated into the Work.
- D. Operation and Maintenance Manuals: Assemble a complete set of operation and maintenance data indicating operation and maintenance of each system, subsystem, and piece of equipment not part of a system.
 1. Engage a factory-authorized service representative to assemble and prepare information for each system, subsystem, and piece of equipment not part of a system.
 2. Prepare a separate manual for each system and subsystem, in the form of an instructional manual for use by Owner's operating personnel.
- E. Manufacturers' Data: Where manuals contain manufacturers' standard printed data, include only sheets pertinent to product or component installed. Mark each sheet to identify each product or component incorporated into the Work. If data include more than one item in a tabular format, identify each item using appropriate references from the Contract Documents. Identify data applicable to the Work and delete references to information not applicable.
 1. Prepare supplementary text if manufacturers' standard printed data are not available and where the information is necessary for proper operation and maintenance of equipment or systems.
- F. Drawings: Prepare drawings supplementing manufacturers' printed data to illustrate the relationship of component parts of equipment and systems and to illustrate control sequence and flow diagrams. Coordinate these drawings with information contained in Record Drawings to ensure correct illustration of completed installation.
 1. Do not use original Project Record Documents as part of operation and maintenance manuals.
 2. Comply with requirements of newly prepared Record Drawings in Division 01 Section "Project Record Documents."
- G. Comply with Division 01 Section "Closeout Procedures" for schedule for submitting operation and maintenance documentation.

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END OF SECTION 017823

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SECTION 017839 - PROJECT RECORD DOCUMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes administrative and procedural requirements for Project Record Documents, including the following:
 - 1. Record Drawings.
 - 2. Record Specifications.
 - 3. Record Product Data.
- B. Related Sections include the following:
 - 1. Division 01 Section "Closeout Procedures" for general closeout procedures.
 - 2. Division 01 Section "Operation and Maintenance Data" for operation and maintenance manual requirements.
 - 3. Divisions 02 through 49 Sections for specific requirements for Project Record Documents of the Work in those Sections.

1.3 SUBMITTALS

- A. Record Drawings: Comply with the following:
 - 1. Number of Copies: Submit one set(s) of marked-up Record Prints.
- B. Record Specifications: Submit one copy of Project's Specifications, including addenda and contract modifications.
- C. Record Product Data: Submit one copy of each Product Data submittal.
 - 1. Where Record Product Data is required as part of operation and maintenance manuals, submit marked-up Product Data as an insert in manual instead of submittal as Record Product Data.

PART 2 - PRODUCTS

2.1 RECORD DRAWINGS

- A. Record Prints: Maintain one set of blue- or black-line white prints of the Contract Drawings and Shop Drawings.
1. Preparation: Mark Record Prints to show the actual installation where installation varies from that shown originally. Require individual or entity who obtained record data, whether individual or entity is Installer, subcontractor, or similar entity, to prepare the marked-up Record Prints.
 - a. Give particular attention to information on concealed elements that would be difficult to identify or measure and record later.
 - b. Accurately record information in an understandable drawing technique.
 - c. Record data as soon as possible after obtaining it. Record and check the markup before enclosing concealed installations.
 2. Content: Types of items requiring marking include, but are not limited to, the following:
 - a. Dimensional changes to Drawings.
 - b. Revisions to details shown on Drawings.
 - c. Depths of foundations below first floor.
 - d. Locations and depths of underground utilities.
 - e. Revisions to routing of piping and conduits.
 - f. Revisions to electrical circuitry.
 - g. Actual equipment locations.
 - h. Duct size and routing.
 - i. Locations of concealed internal utilities.
 - j. Changes made by Change Order or Change Directive.
 - k. Changes made following Architect's written orders.
 - l. Details not on the original Contract Drawings.
 - m. Field records for variable and concealed conditions.
 - n. Record information on the Work that is shown only schematically.
 3. Mark the Contract Drawings or Shop Drawings, whichever is most capable of showing actual physical conditions, completely and accurately. If Shop Drawings are marked, show cross-reference on the Contract Drawings.
 4. Mark record sets with erasable, red-colored pencil. Use other colors to distinguish between changes for different categories of the Work at same location.
 5. Mark important additional information that was either shown schematically or omitted from original Drawings.
 6. Note Construction Change Directive numbers, alternate numbers, Change Order numbers, and similar identification, where applicable.
- B. Format: Identify and date each Record Drawing; include the designation "PROJECT RECORD DRAWING" in a prominent location.

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1. Record Prints: Organize Record Prints and newly prepared Record Drawings into manageable sets. Bind each set with durable paper cover sheets. Include identification on cover sheets.
2. Identification: As follows:
 - a. Project name.
 - b. Date.
 - c. Designation "PROJECT RECORD DRAWINGS."
 - d. Name of Architect.
 - e. Name of Contractor.

2.2 RECORD SPECIFICATIONS

- A. Preparation: Mark Specifications to indicate the actual product installation where installation varies from that indicated in Specifications, addenda, and contract modifications.
 1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
 2. Mark copy with the proprietary name and model number of products, materials, and equipment furnished, including substitutions and product options selected.
 3. Record the name of manufacturer, supplier, Installer, and other information necessary to provide a record of selections made.
 4. For each principal product, indicate whether Record Product Data has been submitted in operation and maintenance manuals instead of submitted as Record Product Data.
 5. Note related Change Orders, Record Product Data, and Record Drawings where applicable.

2.3 RECORD PRODUCT DATA

- A. Preparation: Mark Product Data to indicate the actual product installation where installation varies substantially from that indicated in Product Data submittal.
 1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
 2. Include significant changes in the product delivered to Project site and changes in manufacturer's written instructions for installation.
 3. Note related Change Orders, Record Specifications, and Record Drawings where applicable.

2.4 MISCELLANEOUS RECORD SUBMITTALS

- A. Assemble miscellaneous records required by other Specification Sections for miscellaneous record keeping and submittal in connection with actual performance of the Work. Bind or file miscellaneous records and identify each, ready for continued use and reference.

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PART 3 - EXECUTION

3.1 RECORDING AND MAINTENANCE

- A. Recording: Maintain one copy of each submittal during the construction period for Project Record Document purposes. Post changes and modifications to Project Record Documents as they occur; do not wait until the end of Project.
- B. Maintenance of Record Documents and Samples: Store Record Documents and Samples in the field office apart from the Contract Documents used for construction. Do not use Project Record Documents for construction purposes. Maintain Record Documents in good order and in a clean, dry, legible condition, protected from deterioration and loss. Provide access to Project Record Documents for Architect's reference during normal working hours.

END OF SECTION 017839

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SECTION 017900 - DEMONSTRATION AND TRAINING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes administrative and procedural requirements for instructing Owner's personnel, including the following:
 - 1. Demonstration of operation of systems, subsystems, and equipment.
 - 2. Training in operation and maintenance of systems, subsystems, and equipment.
 - 3. Demonstration and training videotapes.
- B. Related Sections include the following:
 - 1. Division 01 Section "Project Management and Coordination" for requirements for preinstruction conferences.
 - 2. Divisions 02 through 49 Sections for specific requirements for demonstration and training for products in those Sections.
- C. Allowances: Furnish demonstration and training instruction time under the Demonstration and Training Allowance as specified in Division 01 Section "Allowances."
- D. Unit Price for Instruction Time: Length of instruction time will be measured by actual time spent performing demonstration and training in required location. No payment will be made for time spent assembling educational materials, setting up, or cleaning up.

1.3 SUBMITTALS

- A. Instruction Program: Submit two copies of outline of instructional program for demonstration and training, including a schedule of proposed dates, times, length of instruction time, and instructors' names for each training module. Include learning objective and outline for each training module.
 - 1. At completion of training, submit one complete training manual(s) for Owner's use.
- B. Qualification Data: For instructor.

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- C. Attendance Record: For each training module, submit list of participants and length of instruction time.
- D. Evaluations: For each participant and for each training module, submit results and documentation of performance-based test.
- E. Demonstration and Training Videotapes: Submit two copies within 5 working days of end of each training module.
 - 1. Identification: On each copy, provide an applied label with the following information:
 - a. Name of Project.
 - b. Name and address of photographer.
 - c. Name of Architect.
 - d. Name of Contractor.
 - e. Date videotape was recorded.
 - 2. Transcript: Prepared on 8-1/2-by-11-inch (215-by-280-mm) paper, punched and bound in heavy-duty, 3-ring, vinyl-covered binders. Mark appropriate identification on front and spine of each binder. Include a cover sheet with same label information as the corresponding videotape. Include name of Project and date of videotape on each page.

1.4 QUALITY ASSURANCE

- A. Facilitator Qualifications: A firm or individual experienced in training or educating maintenance personnel in a training program similar in content and extent to that indicated for this Project, and whose work has resulted in training or education with a record of successful learning performance.
- B. Instructor Qualifications: A factory-authorized service representative, complying with requirements in Division 01 Section "Quality Requirements," experienced in operation and maintenance procedures and training.
- C. Photographer Qualifications: A professional photographer who is experienced photographing construction projects.
- D. Preinstruction Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination." Review methods and procedures related to demonstration and training including, but not limited to, the following:
 - 1. Inspect and discuss locations and other facilities required for instruction.
 - 2. Review and finalize instruction schedule and verify availability of educational materials, instructors' personnel, audiovisual equipment, and facilities needed to avoid delays.
 - 3. Review required content of instruction.
 - 4. For instruction that must occur outside, review weather and forecasted weather conditions and procedures to follow if conditions are unfavorable.

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1.5 COORDINATION

- A. Coordinate instruction schedule with Owner's operations. Adjust schedule as required to minimize disrupting Owner's operations.
- B. Coordinate instructors, including providing notification of dates, times, length of instruction time, and course content.
- C. Coordinate content of training modules with content of approved emergency, operation, and maintenance manuals. Do not submit instruction program until operation and maintenance data has been reviewed and approved by Architect.

PART 2 - PRODUCTS

2.1 INSTRUCTION PROGRAM

- A. Program Structure: Develop an instruction program that includes individual training modules for each system and equipment not part of a system, as required by individual Specification Sections, and as follows:
 - 1. HVAC systems, including air-handling equipment, air distribution systems, and terminal equipment, and devices.
 - 2. HVAC instrumentation and controls.
 - 3. Electrical service and distribution, including transformers, switchboards, panelboards, uninterruptible power supplies, and motor controls.
 - 4. Lighting equipment and controls.
 - 5. Communication systems, including intercommunication, surveillance, clocks and programming, voice and data, and television equipment.
 - 6. Feature Fountains & Splash Pad equipment
 - 7. Irrigation System Controls
 - 8. Water Fountain
 - 9. Shade Shelter
- B. Training Modules: Develop a learning objective and teaching outline for each module. Include a description of specific skills and knowledge that participant is expected to master. For each module, include instruction for the following:
 - 1. Basis of System Design, Operational Requirements, and Criteria: Include the following:
 - a. System, subsystem, and equipment descriptions.
 - b. Performance and design criteria if Contractor is delegated design responsibility.
 - c. Operating standards.
 - d. Regulatory requirements.
 - e. Equipment function.
 - f. Operating characteristics.

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- g. Limiting conditions.
 - h. Performance curves.
2. Documentation: Review the following items in detail:
- a. Emergency manuals.
 - b. Operations manuals.
 - c. Maintenance manuals.
 - d. Project Record Documents.
 - e. Identification systems.
 - f. Warranties and bonds.
 - g. Maintenance service agreements and similar continuing commitments.
3. Emergencies: Include the following, as applicable:
- a. Instructions on meaning of warnings, trouble indications, and error messages.
 - b. Instructions on stopping.
 - c. Shutdown instructions for each type of emergency.
 - d. Operating instructions for conditions outside of normal operating limits.
 - e. Sequences for electric or electronic systems.
 - f. Special operating instructions and procedures.
4. Operations: Include the following, as applicable:
- a. Startup procedures.
 - b. Equipment or system break-in procedures.
 - c. Routine and normal operating instructions.
 - d. Regulation and control procedures.
 - e. Control sequences.
 - f. Safety procedures.
 - g. Instructions on stopping.
 - h. Normal shutdown instructions.
 - i. Operating procedures for emergencies.
 - j. Operating procedures for system, subsystem, or equipment failure.
 - k. Seasonal and weekend operating instructions.
 - l. Required sequences for electric or electronic systems.
 - m. Special operating instructions and procedures.
5. Adjustments: Include the following:
- a. Alignments.
 - b. Checking adjustments.
 - c. Noise and vibration adjustments.
 - d. Economy and efficiency adjustments.
6. Troubleshooting: Include the following:
- a. Diagnostic instructions.
 - b. Test and inspection procedures.

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7. Maintenance: Include the following:
 - a. Inspection procedures.
 - b. Types of cleaning agents to be used and methods of cleaning.
 - c. List of cleaning agents and methods of cleaning detrimental to product.
 - d. Procedures for routine cleaning
 - e. Procedures for preventive maintenance.
 - f. Procedures for routine maintenance.
 - g. Instruction on use of special tools.

8. Repairs: Include the following:
 - a. Diagnosis instructions.
 - b. Repair instructions.
 - c. Disassembly; component removal, repair, and replacement; and reassembly instructions.
 - d. Instructions for identifying parts and components.
 - e. Review of spare parts needed for operation and maintenance.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Assemble educational materials necessary for instruction, including documentation and training module. Assemble training modules into a combined training manual.
- B. Set up instructional equipment at instruction location.

3.2 INSTRUCTION

- A. Facilitator: Engage a qualified facilitator to prepare instruction program and training modules, to coordinate instructors, and to coordinate between Contractor and Owner for number of participants, instruction times, and location.
- B. Engage qualified instructors to instruct Owner's personnel to adjust, operate, and maintain systems, subsystems, and equipment not part of a system.
 1. Architect will furnish an instructor to describe basis of system design, operational requirements, criteria, and regulatory requirements.
 2. Owner will furnish an instructor to describe Owner's operational philosophy.
 3. Owner will furnish Contractor with names and positions of participants.
- C. Scheduling: Provide instruction at mutually agreed on times. For equipment that requires seasonal operation, provide similar instruction at start of each season.
 1. Schedule training with Owner, through Architect, with at least 10 days' advance notice.

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- D. Evaluation: At conclusion of each training module, assess and document each participant's mastery of module by use of a demonstration performance-based test.
- E. Cleanup: Collect used and leftover educational materials and remove from Project site. Remove instructional equipment. Restore systems and equipment to condition existing before initial training use.

3.3 DEMONSTRATION AND TRAINING VIDEOTAPES

- A. General: Engage a qualified commercial photographer to record demonstration and training videotapes. Record each training module separately. Include classroom instructions and demonstrations, board diagrams, and other visual aids, but not student practice.
 - 1. At beginning of each training module, record each chart containing learning objective and lesson outline.
- B. Video Format: Digital Format compatible with owner's systems.
- C. Recording: Mount camera on tripod before starting recording, unless otherwise necessary to show area of demonstration and training. Display continuous running time.
- D. Narration: Describe scenes on videotape by audio narration by microphone while videotape is recorded. Include description of items being viewed. Describe vantage point, indicating location, direction (by compass point), and elevation or story of construction.
- E. Transcript: Provide a typewritten transcript of the narration. Display images and running time captured from videotape opposite the corresponding narration segment.

END OF SECTION 017900

TILE FLOORING
SECTION 09 30 00

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Exterior Ceramic tile.
 - 2. Stone thresholds.
 - 3. Waterproof membrane.
 - 4. Metal edge strips.

- B. Related Sections:
NONE

1.3 DEFINITIONS

- A. General: Definitions in the ANSI A108 series of tile installation standards and in ANSI A137.1 apply to Work of this Section unless otherwise specified.
- B. ANSI A108 Series: ANSI A108.01, ANSI A108.02, ANSI A108.1A, ANSI A108.1B, ANSI A108.1C, ANSI A108.4, ANSI A108.5, ANSI A108.6, ANSI A108.8, ANSI A108.9, ANSI A108.10, ANSI A108.11, ANSI A108.12, ANSI A108.13, ANSI A108.14, ANSI A108.15, ANSI A108.16, and ANSI A108.17, which are contained in "American National Standard Specifications for Installation of Ceramic Tile."
- C. Module Size: Actual tile size plus joint width indicated.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: Show locations of each type of tile and tile pattern. Show widths, details, and locations of expansion, contraction, control, and isolation joints in tile substrates and finished tile surfaces.
- C. Samples for Verification:
 - 1. Full-size units of each type and composition of tile and for each color and finish

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required.

- 2.
3. Assembled samples mounted on a rigid panel, with grouted joints, for each type and composition of tile and for each color and finish required. Make samples at least 12 inches square, but not fewer than 4 tiles. Use grout of type and in color or colors approved for completed Work.
4. Full-size units of each type of trim and accessory for each color and finish required.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For qualified Installer.
- B. Master Grade Certificates: For each shipment, type, and composition of tile, signed by tile manufacturer and Installer.

1.6 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For each type of floor tile to include in maintenance manuals. Include instructions for maintaining the dynamic coefficient of friction.

1.7 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match and are from same production runs as products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 1. Tile and Trim Units: Furnish quantity of full-size units equal to 3 percent of amount installed for each type, composition, color, pattern, and size indicated.
 2. Grout: Furnish quantity of grout equal to 3 percent of amount installed for each type, composition, and color indicated.

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1.8 QUALITY ASSURANCE

A. Installer Qualifications:

1. Installer is a five-star member of the National Tile Contractors Association or a Trowel of Excellence member of the Tile Contractors' Association of America.
2. Installer's supervisor for Project holds the International Masonry Institute's Foreman Certification.
3. Installer employs Ceramic Tile Education Foundation Certified Installers or installers recognized by the U.S. Department of Labor as Journeyman Tile Layers.

1.9 DELIVERY, STORAGE, AND HANDLING

- A. Deliver and store packaged materials in original containers with seals unbroken and labels intact until time of use. Comply with requirements in ANSI A137.1 for labeling tile packages.
- B. Store tile and cementitious materials on elevated platforms, under cover, and in a dry location.
- C. Store aggregates where grading and other required characteristics can be maintained and contamination can be avoided.
- D. Store liquid materials in unopened containers and protected from freezing.
- E. Handle tile that has temporary protective coating on exposed surfaces to prevent coated surfaces from contacting backs or edges of other units. If coating does contact bonding surfaces of tile, remove coating from bonding surfaces before setting tile.

1.10 PROJECT CONDITIONS

- A. Environmental Limitations: Do not install tile until construction in spaces is complete and ambient temperature and humidity conditions are maintained at the levels indicated in referenced standards and manufacturer's written instructions.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. PORCELANOSA

1. Obtain tile of each type and color or finish from same production run and of consistent quality in appearance and physical properties for each contiguous area.
- B. Source Limitations for Setting and Grouting Materials: Obtain ingredients of a uniform quality for each mortar, adhesive, and grout component from single manufacturer and each aggregate from single source or producer.
1. Obtain setting and grouting materials, except for unmodified Portland cement and aggregate, from single manufacturer.

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2. Obtain waterproof membrane, except for sheet products, from manufacturer of setting and grouting materials.
- C. Source Limitations for Other Products: Obtain each of the following products specified in this Section from a single manufacturer:
 1. Waterproof membrane.
 2. Joint sealants.

2.2 PRODUCTS, GENERAL

- A. ANSI Ceramic Tile Standard: Provide tile that complies with ANSI A137.1 for types, compositions, and other characteristics indicated.
 1. Provide tile complying with Standard grade requirements unless otherwise indicated.
- B. ANSI Glass Tile Standard: Provide glass tile that complies with ANSI A137.2 for types and other characteristics indicated.
 1. Provide tile complying with Standard grade requirements unless otherwise indicated.
- C. ANSI Standards for Tile Installation Materials: Provide materials complying with ANSI A108.02, ANSI standards referenced in other Part 2 articles, ANSI standards referenced by TCNA installation methods specified in tile installation schedules, and other requirements specified.
- D. FloorScore Compliance: Tile for floors shall comply with requirements of FloorScore Standard.
- E. Factory Blending: For tile exhibiting color variations within ranges, blend tile in factory and package so tile units taken from one package show same range in colors as those taken from other packages and match approved Samples.
- F. Mounting: For factory-mounted tile, provide back- or edge-mounted tile assemblies as standard with manufacturer unless otherwise indicated.
 1. Where tile is indicated for installation in wet areas, do not use back- or edge-mounted tile assemblies unless tile manufacturer specifies in writing that this type of mounting is suitable for installation indicated and has a record of successful in-service performance.
- G. Factory-Applied Temporary Protective Coating: Where indicated under tile type, protect exposed surfaces of tile against adherence of mortar and grout by precoating with continuous film of petroleum paraffin wax, applied hot. Do not coat unexposed tile surfaces.

2.3 TILE PRODUCTS

- A. Tile.
 1. TANZANIA SILVER 10"X59" PLANK.

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2.4 STONE THRESHOLDS

- A. General: Fabricate to sizes and profiles indicated or required to provide transition between adjacent floor finishes.
 - 1. Bevel edges at 1:2 slope, with lower edge of bevel aligned with or up to 1/16 inch above adjacent floor surface. Finish bevel to match top surface of threshold. Limit height of threshold to 1/2 inch or less above adjacent floor surface.
- B. Marble Thresholds: ASTM C 503, with a minimum abrasion resistance of 10 per ASTM C 1353 or ASTM C 241 and with honed finish.
 - 1. Description: Uniform, fine- to medium-grained white stone with gray veining.

2.5 WATERPROOF MEMBRANE

- A. General: Manufacturer's standard product that complies with ANSI A118.10 and is recommended by the manufacturer for the application indicated. Include reinforcement and accessories recommended by manufacturer.
- B. Fabric-Reinforced, Fluid-Applied Membrane: System consisting of liquid-latex rubber or elastomeric polymer and continuous fabric reinforcement.
 - 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Ardex Americas; 8 + 9.
 - b. Custom Building Products; 9240 Waterproofing and Anti-Fracture Membrane.
 - c. Laticrete International, Inc.; Laticrete 9235 Waterproof Membrane.
 - d. MAPEI Corporation; Mapelastic HPG with MAPEI Fiberglass Mesh.

2.6 SETTING MATERIALS

- A. Exterior Applications: Provide products formulated for exterior use.

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B. Portland Cement Mortar (Thickset) Installation Materials: ANSI A108.02.

1. Location: Shower floors on Level 2.
2. Cleavage Membrane: Asphalt felt, ASTM D 226, Type I (No. 15); or polyethylene sheeting, ASTM D 4397, 4.0 mils thick.
3. Reinforcing Wire Fabric: Galvanized, welded wire fabric, 2 by 2 inches by 0.062-inch diameter; comply with ASTM A 185 and ASTM A 82 except for minimum wire size.
4. Expanded Metal Lath: Diamond-mesh lath complying with ASTM C 847.
 - a. Base Metal: Zinc-coated (galvanized) steel sheet.
 - b. Configuration over Studs and Furring: Flat.
 - c. Configuration over Solid Surfaces: Self furring.
 - d. Weight: 3.4 lb/sq. yd.
5. Latex Additive: Acrylic resin or styrene-butadiene-rubber water emulsion, serving as replacement for part or all of gaging water, of type specifically recommended by latex-additive manufacturer for use with field-mixed portland cement and aggregate mortar bed.

C. Improved Modified Latex-Portland Cement Mortar (Thin Set): ANSI A118.15.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Ardex Americas.
 - b. Custom Building Products.
 - c. Laticrete International, Inc.
 - d. MAPEI Corporation.
2. Provide one of the following:
 - a. Provide prepackaged, dry-mortar mix containing dry, redispersible, vinyl acetate or acrylic additive to which only water must be added at Project site.
 - b. Provide prepackaged, dry-mortar mix combined with acrylic resin or styrene-butadiene-rubber liquid-latex additive at Project site.
3. For wall applications, provide mortar that complies with requirements for nonsagging mortar in addition to the other requirements in ANSI A118.15.
4. Glass Tile: Provide product that is specifically formulated for glass tile applications:
 - a. Color: White.
 - b. Type: Non-sanded.

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- D. Medium-Bed, Latex-Portland Cement Mortar: Comply with requirements in ANSI A118.4. Provide product that is specifically formulated for medium bed applications and that is approved by manufacturer for application thickness indicated in Part 3.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Ardex Americas.
 - b. Custom Building Products.
 - c. Laticrete International, Inc.
 - d. MAPEI Corporation.
 2. Provide one of the following:
 - a. Provide prepackaged, dry-mortar mix containing dry, redispersible, vinyl acetate or acrylic additive to which only water must be added at Project site.
 - b. Provide prepackaged, dry-mortar mix combined with acrylic resin or styrene-butadiene-rubber liquid-latex additive at Project site.

2.7 GROUT MATERIALS

- A. High-Performance Polymer-Modified Tile Grout: ANSI A118.7.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Ardex Americas.
 - b. Custom Building Products.
 - c. Laticrete International, Inc.
 - d. MAPEI Corporation.
 2. Provide one of the following:
 - a. Polymer Type: Ethylene vinyl acetate or acrylic additive, in dry, redispersible form, prepackaged with other dry ingredients.
 - b. Polymer Type: Acrylic resin or styrene-butadiene rubber in liquid-latex form for addition to prepackaged dry-grout mix.

2.8 TRIM

- A. Metal Edge Strips: Angle or L-shape, height to match floor tile and setting-bed thickness, metallic or combination of metal and PVC or neoprene base, designed specifically for flooring applications; stainless-steel, ASTM A 666, 300 Series exposed-edge material.

2.9 MISCELLANEOUS MATERIALS

- A. Trowelable Underlayments and Patching Compounds: Latex-modified, portland cement-based formulation provided or approved by manufacturer of tile-setting materials for installations

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indicated.

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- B. Temporary Protective Coating: Either product indicated below that is formulated to protect exposed surfaces of tile against adherence of mortar and grout; compatible with tile, mortar, and grout products; and easily removable after grouting is completed without damaging grout or tile.
 - 1. Petroleum paraffin wax, fully refined and odorless, containing at least 0.5 percent oil with a melting point of 120 to 140 deg F per ASTM D 87.
 - 2. Grout release in form of manufacturer's standard proprietary liquid coating that is specially formulated and recommended for use as temporary protective coating for tile.
- C. Tile Cleaner: A neutral cleaner capable of removing soil and residue without harming tile and grout surfaces, specifically approved for materials and installations indicated by tile and grout manufacturers.

2.10 MIXING MORTARS AND GROUT

- A. Mix mortars and grouts to comply with referenced standards and mortar and grout manufacturers' written instructions.
- B. Add materials, water, and additives in accurate proportions.
- C. Obtain and use type of mixing equipment, mixer speeds, mixing containers, mixing time, and other procedures to produce mortars and grouts of uniform quality with optimum performance characteristics for installations indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions where tile will be installed, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of installed tile.
 - 1. Verify that substrates for setting tile are firm, dry, clean, free of coatings that are incompatible with tile-setting materials including curing compounds and other substances that contain soap, wax, oil, or silicone; and comply with flatness tolerances required by ANSI A108.01 for installations indicated.
 - 2. Verify that concrete substrates for tile floors installed with thin-set mortar and medium set mortar comply with surface finish requirements in ANSI A108.01 for installations indicated.
 - a. Verify that surfaces that received a steel trowel finish have been mechanically scarified.
 - b. Verify that protrusions, bumps, and ridges have been removed by sanding or grinding.
 - 3. Verify that installation of grounds, anchors, recessed frames, electrical and mechanical units of work, and similar items located in or behind tile has been completed.
 - 4. Verify that joints and cracks in tile substrates are coordinated with tile joint locations; if

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not coordinated, adjust joint locations in consultation with Architect.

- B. Proceed with installation only after unsatisfactory conditions have been corrected.

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3.2 PREPARATION

- A. Fill cracks, holes, and depressions in concrete substrates for tile floors installed with thin-set mortar with trowelable leveling and patching compound specifically recommended by tile-setting material manufacturer.
- B. Where indicated, prepare substrates to receive waterproofing by applying a reinforced mortar bed that complies with ANSI A108.1A and is sloped 1/4 inch per foot toward drains.
- C. Blending: For tile exhibiting color variations, verify that tile has been factory blended and packaged so tile units taken from one package show same range of colors as those taken from other packages and match approved Samples. If not factory blended, either return to manufacturer or blend tiles at Project site before installing.
- D. Field-Applied Temporary Protective Coating: If indicated under tile type or needed to prevent grout from staining or adhering to exposed tile surfaces, precoat them with continuous film of temporary protective coating, taking care not to coat unexposed tile surfaces.

3.3 TILE INSTALLATION

- A. Comply with TCNA's "Handbook for Ceramic, Glass, and Stone Tile Installation" for TCNA installation methods specified in tile installation schedules. Comply with parts of the ANSI A108 Series "Specifications for Installation of Ceramic Tile" that are referenced in TCNA installation methods, specified in tile installation schedules, and apply to types of setting and grouting materials used.
 - 1. For the following installations, follow procedures in the ANSI A108 Series of tile installation standards for providing 95 percent mortar coverage:
 - a. Tile floors in wet areas.
 - b. Tile floors composed of tiles 8 by 8 inches or larger.
 - c. Tile floors composed of rib-backed tiles.
- B. Tiles 15 Inches or Larger:
 - 1. Install with medium set beginning with one-half inch thick notched layer and finishing with one-quarter finished thickness.
 - 2. Prior to setting, dry layout tiles in appropriate pattern to ensure no lippage will occur.
- C. Extend tile work into recesses and under or behind equipment and fixtures to form complete covering without interruptions unless otherwise indicated. Terminate work neatly at obstructions, edges, and corners without disrupting pattern or joint alignments.
- D. Accurately form intersections and returns. Perform cutting and drilling of tile without marring visible surfaces. Carefully grind cut edges of tile abutting trim, finish, or built-in items for straight aligned joints. Fit tile closely to electrical outlets, piping, fixtures, and other penetrations so plates, collars, or covers overlap tile.
- E. Provide manufacturer's standard trim shapes where necessary to eliminate exposed tile edges.

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- F. Where accent tile differs in thickness from field tile, vary setting-bed thickness so that tiles are flush.

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- G. Glass Tile: Install so that trowel marks and patterns do not show through glass tile.
- H. Jointing Pattern: Lay tile in grid pattern unless otherwise indicated. Lay out tile work and center tile fields in both directions in each space or on each wall area. Lay out tile work to minimize the use of pieces that are less than half of a tile. Provide uniform joint widths unless otherwise indicated.
1. For tile mounted in sheets, make joints between tile sheets same width as joints within tile sheets so joints between sheets are not apparent in finished work.
 2. Where adjoining tiles on floor, base, walls, or trim are specified or indicated to be same size, align joints.
 3. Where tiles are specified or indicated to be whole integer multiples of adjoining tiles on floor, base, walls, or trim, align joints unless otherwise indicated.
- I. Joint Widths and Grout: Unless otherwise indicated, install tile with the joint widths recommended by tile manufacturer for each type of tile.
1. High-Performance Polymer-Modified Tile Grout: Select sanded or unsanded to best suit the tile manufacturer's recommended joint width.
- J. Lay out tile wainscots to dimensions indicated or to next full tile beyond dimensions indicated.
- K. Movement Joints: Provide movement joints and other sealant-filled joints, including control, contraction, and isolation joints, where indicated or in accordance with TCNA EJ171, whichever is the lesser dimension. Form joints during installation of setting materials, mortar beds, and tile. Do not saw-cut joints after installing tiles.
1. Where joints occur in concrete substrates, locate joints in tile surfaces directly above them.
 2. Joint Design: TCNA EJ171 as appropriate to each tile assembly.
 3. Joint Sealant: Comply with Section 07 92 00 "Joint Sealants".
- L. Stone Thresholds: Install stone thresholds in same type of setting bed as adjacent floor unless otherwise indicated.
1. At locations where mortar bed (thickset) would otherwise be exposed above adjacent floor finishes, set thresholds in latex-portland cement mortar (thin set).
 2. Do not extend waterproofing under thresholds set in latex-portland cement mortar. Fill joints between such thresholds and adjoining tile set on waterproofing with elastomeric sealant.
 3. Chamfer each exposed edge in accordance with the Drawing details.
 4. Recess into slab so that the finish surface of the threshold is in accordance with the Drawing details.
- M. Metal Edge Strips: Install where exposed edge of tile flooring meets carpet, wood, or other flooring that finishes flush with or below top of tile and no threshold is indicated.
- N. Grout Sealer: Apply grout sealer to cementitious grout joints in tile floors according to grout-sealer manufacturer's written instructions. As soon as grout sealer has penetrated grout joints, remove excess sealer and sealer from tile faces by wiping with soft cloth.

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3.4 WATERPROOFING INSTALLATION

- A. Install waterproofing to comply with ANSI A108.13 and manufacturer's written instructions to produce waterproof membrane of uniform thickness and bonded securely to substrate.
- B. Do not install tile or setting materials over waterproofing until waterproofing has cured and been tested to determine that it is watertight.

3.5 CLEANING AND PROTECTING

- A. Cleaning: On completion of placement and grouting, clean all ceramic tile surfaces so they are free of foreign matter.
 - 1. Remove latex-portland cement grout residue from tile as soon as possible.
 - 2. Clean grout smears and haze from tile according to tile and grout manufacturer's written instructions but no sooner than 10 days after installation. Use only cleaners recommended by tile and grout manufacturers and only after determining that cleaners are safe to use by testing on samples of tile and other surfaces to be cleaned. Protect metal surfaces and plumbing fixtures from effects of cleaning. Flush surfaces with clean water before and after cleaning.
 - 3. Remove temporary protective coating by method recommended by coating manufacturer and that is acceptable to tile and grout manufacturer. Trap and remove coating to prevent drain clogging.
- B. Protect installed tile work with kraft paper or other heavy covering during construction period to prevent staining, damage, and wear. If recommended by tile manufacturer, apply coat of neutral protective cleaner to completed tile walls and floors.
- C. Prohibit foot and wheel traffic from tiled floors for at least seven days after grouting is completed.
- D. Before final inspection, remove protective coverings and rinse neutral protective cleaner from tile surfaces.

3.6 EXTERIOR TILE INSTALLATION SCHEDULE

- A. None required.

3.7 INTERIOR TILE INSTALLATION SCHEDULE

- A. Interior Floor Installations, Concrete Subfloor:
 - 1. Tile Installation F113: Thin-set mortar; TCNA F113.
 - a. Location: On-ground.
 - b. Thin-Set Mortar: Latex- portland cement mortar.
 - c. Grout: Polymer-modified grout.

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2. Tile Installation F113: Medium-set mortar; TCNA F113. For tiles with minimum dimension of 15 inches or greater.
 - a. Location: On-ground.
 - b. Thin-Set Mortar: Latex- portland cement mortar.
 - c. Grout: Polymer-modified grout.
 3. Tile Installation F113A: Thin-set mortar on waterproof membrane; TCNA F113A.
 - a. Location: Above-ground.
 - b. Thin-Set Mortar: Latex- portland cement mortar.
 - c. Grout: Polymer-modified grout.
 4. Tile Installation F113A: Medium-set mortar on waterproof membrane; TCNA F113A. For tiles with minimum dimension of 15 inches or greater.
 - a. Location: Above-ground.
 - b. Thin-Set Mortar: Latex- portland cement mortar.
 - c. Grout: Polymer-modified grout.
- B. Interior Floor Installations, Wood Subfloor:
1. Tile Installation F152: Thin-set mortar on waterproof membrane; TCNA F152.
 - a. Location: Above-ground.
 - b. Grout: Polymer-modified grout.
- C. Interior Wall Installations, Masonry or Concrete:
1. Tile Installation W202 I: Thin-set mortar; TCNA W202 I.
 - a. Thin-Set Mortar: Latex- portland cement mortar.
 - b. Grout: Polymer-modified grout.
- D. Interior Wall Installations, Metal or Wood Studs or Furring:
1. Tile Installation W244C: Thin-set mortar with waterproofing membrane on cementitious backer units; TCNA W244.
 - a. Thin-Set Mortar: Latex- portland cement mortar.
 - b. Grout: Polymer-modified grout.
- E. Shower Receptor and Wall Installations, Concrete or Masonry:
1. Floor Tile Installation B421: Cement mortar bed (thickset) on waterproof membrane; TCNA B421.
 - a. Bond Coat Mortar: Latex- portland cement mortar.
 - b. Grout: Polymer-modified grout.

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2. Wall Tile Installation B415: Thin-set mortar on waterproof membrane on concrete or on masonry units; TCNA B415.
 - a. Thin-Set Mortar: Latex-portland cement mortar.
 - b. Grout: Polymer-modified grout.
- F. Shower Receptor and Wall Installations, Metal Studs:
1. Floor Tile Installation B415: Cement mortar bed (thickset) over waterproof membrane; TCNA B415 and ANSI A108.1A.
 - a. Bond Coat Mortar: Latex- portland cement mortar.
 - b. Grout: Polymer-modified grout.
 2. Wall Tile Installation B415: Thin-set mortar on waterproof membrane on cementitious backer units; TCNA B415.
 - a. Thin-Set Mortar: Latex-portland cement mortar.
 - b. Grout: Polymer-modified grout.

END OF SECTION 09 30 00

SECTION 31 05 13

SOILS FOR EARTHWORK

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes structural subsoil materials.
- B. Related Sections:
 - 1. Section 014000 Quality Control
 - 2. Section 312317 - Trenching.

1.2 REFERENCES

- A. ASTM D698 - Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures, Using 5.5 lb Rammer and 12 inch Drop.
- B. ASTM D1556 - Test Method for Density of Soil in Place by the Sand-Cone Method.
- C. ASTM D2487 - Classification of Soils for Engineering Purposes.
- D. ASTM D2922 - Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).
- E. ASTM D3017 - Test Method for Moisture Content of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).
- F. AASHTO T180 (American Association of State Highway and Transportation Officials) – Moisture-Density Relations of Soils Using a 10-lb Rammer and an 18-inch Drop.

1.3 SUBMITTALS

- A. Samples: Submit, in air-tight containers, 10lb sample of each type of fill to testing laboratory.
- B. Materials Source: Submit name of imported materials source.

1.4 QUALITY ASSURANCE

- A. Perform Work in accordance with South Carolina Department of Transportation Standards and Specifications.

PART 2 - PRODUCTS

2.1 SUBSOIL MATERIALS

- A. Soil Type S1:
 - 1. Structural.
 - 2. Well Graded.
 - 3. Free of lumps larger than 2 inches, rocks larger than 1 inches, and debris.
 - 4. Conforming to South Carolina Department of Transportation Standards and Specifications and AASHTO M-145, A-1 Soils.

2.2 SOURCE QUALITY CONTROL

- A. Section 014000 – Quality Control: Testing and analysis of soil material.
- B. Testing and Analysis of Subsoil Material: Perform in accordance with ASTM D698. ASTM D2922. ASTM D3017.
- C. If tests indicate materials do not meet specified requirements, change material and retest.
- D. Provide materials of each type from same source throughout the Work.
- E. Coordinate material source and import process in advance with Geotechnical Engineer and construction and materials testing lab.

PART 3 - EXECUTION

3.1 SOIL REMOVAL

- A. Excavate subsoil and topsoil from areas designated. Strip topsoil to whatever depth it may occur in designated areas.
- B. Remove lumped soil, boulders, and rock.
- C. Stockpile excavated material in area designated on site and remove excess material not being used or suitable for re-use, from site.

3.2 STOCKPILING

- A. Stockpile materials on site at locations designated by Engineer.
- B. Stockpile in sufficient quantities to meet Project schedule and requirements.
- C. Separate differing materials with dividers or stockpile apart to prevent mixing.
- D. Prevent intermixing of soil types or contamination.
- E. Direct surface water away from stockpile site to prevent erosion or deterioration of materials.

3.3 STOCKPILE CLEANUP

- A. Remove stockpile, leave area in a clean and neat condition. Grade site surface to prevent free standing surface water.

END OF SECTION

SECTION 31 05 16

AGGREGATES FOR EARTHWORK

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes aggregate materials for bedding purposes.
- B. Related Sections:
 - 1. Section 312317 - Trenching.

1.2 REFERENCES

- A. AASHTO M147 (American Association of State Highway and Transportation Officials) - Materials for Aggregate and Soil-Aggregate.
- B. ASTM C136 - Method for Sieve Analysis of Fine and Coarse Aggregates.
- C. ASTM D698 - Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures, Using 5.5lb Rammer and 12 inch Drop.
- D. ASTM D2167 - Test Method for Density and Unit Weight of Soil in Place by the Rubber Balloon Method.
- E. ASTM D2487 - Classification of Soils for Engineering Purposes.
- F. ASTM D2922 - Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).
- G. ASTM D3017 - Test Method for Moisture Content of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).
- H. ASTM D4318 - Test Method for Liquid Limit, Plastic Limit, and Plasticity Index of Soils.

1.3 QUALITY ASSURANCE

- A. Perform Work in accordance with South Carolina Department of Transportation Standards and Specifications.

PART 2 - PRODUCTS

2.1 COARSE AGGREGATE MATERIALS

- A. Coarse Aggregate, Type A1: #57 Stone.
- B. Coarse Aggregate, Type A2: #4 Stone

2.2 SOURCE QUALITY CONTROL

- A. Coarse Aggregate Material - Testing and Analysis: Perform in accordance with ASTM D698.
- B. If tests indicate materials do not meet specified requirements, change material or material source and retest.
- C. Provide materials of each type from same source throughout the Work.

PART 3 - EXECUTION

3.1 STOCKPILING

- A. Stockpile materials on site at locations designated by Engineer.
- B. Stockpile in sufficient quantities to meet Project schedule and requirements.
- C. Separate differing materials with dividers or stockpile apart to prevent mixing.
- D. Direct surface water away from stockpile site so as to prevent erosion or deterioration of materials.

3.2 STOCKPILE CLEANUP

- A. Remove stockpile, leave area in a clean and neat condition. Grade site surface to prevent free standing surface water.

END OF SECTION

SECTION 31 10 00

SITE CLEARING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes removal of surface debris; removal of paving, curbs; removal of trees, shrubs, and other plant life; removal of abandoned utilities; and topsoil excavation.
- B. Related Sections:
 - 1. Section 312213 - Rough Grading.
 - 2. Section 015639 – Tree Protection

PART 2 - PRODUCTS

NOT USED

PART 3 - EXECUTION

3.1 PROTECTION

- A. Locate, identify, and protect utilities that remain, from damage.
- B. Protect trees, plant growth, and features designated to remain, as final landscaping.
- C. Protect bench marks, and survey control points, from damage or displacement.

3.2 CLEARING

- A. Clear areas required for access to site and execution of Work.
- B. Remove trees and shrubs within marked areas. Remove stumps, main root ball, root system to a depth of 12 inches.
- C. Clear undergrowth and deadwood, without disturbing subsoil.

3.3 REMOVAL

- A. Remove debris, rock, and extracted plant life from site.
- B. Remove paving, curbs, and drainage structures as indicated.

3.4 TOPSOIL EXCAVATION

- A. Excavate topsoil from entire site.
- B. Remove excess topsoil from site.

END OF SECTION

SECTION 31 22 13

ROUGH GRADING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes removal of subsoil; and cutting, grading, filling, compacting, the site for site structures.
- B. Related Sections:
 - 1. Section 311000 - Site Clearing.
 - 2. Section 312323 – Fill
 - 3. Section 329119 - Landscape Grading
 - 4. Section 312317 – Trenching
 - 5. Section 329100 – Planting Soil

1.2 REFERENCES

- A. ASTM D698 - Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures, Using 5.5lb Rammer and 12 inch Drop.
- B. ASTM D2922 - Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).
- C. ASTM D3017 - Test Methods for Moisture Content of Soil and Soil-Aggregate Mixtures.

1.3 CLOSEOUT SUBMITTALS

- A. Section 017000 – Project Closeout: Closeout procedures.
- B. Project Record Documents: Accurately record actual locations of utilities remaining by horizontal dimensions, elevations or inverts, and slope gradients.

1.4 QUALITY ASSURANCE

- A. Perform Work in accordance with Georgia Department of Transportation Standards and Specifications.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Topsoil: As specified in Section 329100 – Planting Soil.
- B. Subsoil Fill: Type S1 as specified in Section 310513.

PART 3 - EXECUTION

3.1 EXAMINATION

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- A. Verify that survey bench mark and intended elevations for the Work are as indicated.

3.2 PREPARATION

- A. Identify required lines, levels, contours, and datum.
- B. Stake and flag locations of known utilities.
- C. Locate, identify, and protect utilities that remain, from damage.
- D. Notify utility company to remove and relocate utilities.
- E. Protect above and below grade utilities that remain.
- F. Protect plant life, lawns, and other features remaining as a portion of final landscaping.
- G. Protect bench marks, survey control point, existing structures, fences, sidewalks, paving, and curbs from excavating equipment and vehicular traffic.

3.3 SUBSOIL EXCAVATION

- A. Excavate subsoil from areas to be further excavated, relandscaped, or regraded.
- B. Excavate wet subsoil and process wet material to obtain optimum moisture content or remove from site.
- C. When excavating through roots, perform Work by hand and cut roots with sharp axe.
- D. Stockpile in area designated on site to depth not exceeding 8 feet and protect from erosion. Remove from site subsoil not being reused.
- E. Benching Slopes: Horizontally bench existing slopes greater than 1:4 to key placed fill material to slope to provide firm bearing.
- F. Stability: Replace damaged or displaced subsoil to same requirements as for specified fill.

3.4 FILLING

- A. Install Work in accordance with South Carolina Department of Transportation Standards and Specifications.
- B. Fill areas to contours and elevations with unfrozen materials.
- C. Place fill material on continuous layers and compact in accordance with the schedule at end of this section.
- D. Maintain optimum moisture content of fill materials to attain required compaction density.
- E. Slope grade away from building minimum 2 inches in 10 ft unless noted otherwise.
- F. Make grade changes gradual. Blend slope into level areas.
- G. Remove surplus fill materials from site.

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3.5 TOLERANCES

- A. Top Surface of Subgrade: Plus or minus 1/10 foot from required elevation.

3.6 FIELD QUALITY CONTROL

- A. Testing: In accordance with ASTM D698. ASTM D2922. ASTM D3017.
- B. If tests indicate Work does not meet specified requirements, remove Work, replace and retest.
- C. Frequency of Tests: 1 test/2,000 sq.ft. of fill/2 ft. depth.

3.7 SCHEDULES

- A. Structural Fill:
 - 1. Fill Type S1: Maximum 8 inches compacted depth.
 - 2. Compact to minimum 95 percent of maximum density.
- B. Subsoil Fill:
 - 1. Fill Type S1: Maximum 8 inches compacted depth.
 - 2. Compact to minimum 90 percent of maximum density.
- C. Topsoil Fill:
 - 1. Topsoil: Maximum 6 inches compacted depth.
 - 2. Compact to minimum 90 percent of maximum density.

END OF SECTION

SECTION 31 23 16

EXCAVATION FOR STORMWATER

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes excavating for parking areas, site grading, and site structures.
- B. Related Sections:
 - 1. Section 310513 – Soils for Earthwork
 - 2. Section 312317 - Trenching.

1.2 REFERENCES

- A. ASTM D698, Moisture-Density Relations of Soils and Soil Aggregate Mixtures, Using a 5.5 lb Rammer and a 12 inch Drop.
- B. ASTM D1556, Density of Soil In-Place by the Sand-Cone Method.
- C. ASTM D2049, Relative Density of Cohesionless Soils.
- D. ASTM D2167, Density of Soil in Place by the Rubber-Balloon Method.
- E. ASTM D2922, Density of Soil and Soil Aggregate in Place by Nuclear Methods (Shallow Depth).
- F. South Carolina Department of Transportation Test Designation, SC T 140, Moisture – Density Relations of Soils or Soil – Aggregate Mixture using a 10 lb Rammer and 18-inch Drop.
- G. Local utility standards when working within 24 inches of the respective utility lines.

1.3 SUBMITTALS

- A. Test Reports: Field density test reports. Submit gradation test for all furnished material.

PART 2 - PRODUCTS

Not Used.

PART 3 - EXECUTION

3.1 PREPARATION

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

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3.2 EXCAVATING

- A. Excavate subsoil to accommodate site structures and construction operations.
- B. Contractors attention is directed to the likelihood of encountering groundwater during trenching and excavation. Dewatering of trenches and excavated areas is required to provide dry construction conditions. Refer to the Geotechnical Report by S&ME, Inc.
- C. Compact disturbed load bearing soil in direct contact with foundations to original bearing capacity; perform compaction in accordance with SC T 140.
- D. Do not interfere with 45 degree bearing splay of building foundations.
- E. Grade top perimeter of excavation to prevent surface water from draining into excavation.
- F. Hand trim excavation. Remove loose matter.
- G. Remove lumped subsoil, boulders, and rock up to 1/3 cubic yard measured by volume.
- H. Notify Engineer of unexpected subsurface conditions and discontinue affected Work in area until notified to resume Work.
- I. Remediation of unexpected subsurface conditions shall be coordinated with the Geotechnical Engineer and the construction and materials testing firm.
- J. Unless otherwise directed by the Geotechnical Engineer, correct areas over excavated with Type A1 aggregate and compact to 98% Standard Proctor per SC T 140.
- K. Stockpile excavated material in area designated on site. Remove excess or unsuitable material from site.

3.3 FIELD QUALITY CONTROL

- A. Provide for visual inspection of bearing surfaces.
- B. Testing: In accordance with SC T 140.
- C. If tests indicate Work does not meet specified requirements, remove Work, replace and retest.
- C. Frequency of Tests:
 - (i.) Drainage Structures – At each structure to confirm compliance.
 - (ii) Drainage System (Pipe Trench) – 1 test/50 lf of pipe

3.4 PROTECTION

- A. Prevent displacement or loose soil from falling into excavation; maintain soil stability.
- B. Protect bottom of excavations and soil adjacent to and beneath foundation from freezing.
- B. Protect structures, utilities and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earth operations.

END OF SECTION

SECTION 31 23 17

TRENCHING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes excavating trenches for structures and utilities from 5 feet outside building to municipal utilities or outfalls; compacted fill from top of utility bedding to subgrade elevations; and backfilling and compaction.
- B. Related Sections:
 - 1. Section 310516 - Aggregate.
 - 2. Section 312316 – Excavation for Stormwater

1.2 REFERENCES

- A. ASTM C136 - Method for Sieve Analysis of Fine and Coarse Aggregates.
- B. ASTM D698 - Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures, Using 5.5-lb Rammer and 12-inch Drop.
- C. AASHTO T180 (American Association of State Highway and Transportation Officials) – Moisture-Density Relations of Soils Using a 10-lb Rammer and an 18-inch Drop.
- D. ASTM D2167 - Test Method for Density and Unit Weight of Soil in Place by the Rubber Balloon Method.
- E. ASTM D2922 - Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).
- F. ASTM D3017 - Test Methods for Moisture Content of Soil and Soil-Aggregate Mixtures.

1.3 DEFINITIONS

- A. Utility: Any buried pipe, duct, conduit, or cable.

1.4 FIELD MEASUREMENTS

- A. Verify field measurements prior to fabrication.

1.5 COORDINATION

- A. Verify work associated with lower elevation utilities is complete before placing higher elevation utilities.
- B. Coordinate with South Carolina Department of Transportation 7-days (minimum) ahead of any construction in right-of-way.

PART 2 - PRODUCTS

2.1 FILL MATERIALS

- A. Fill Type S1: As specified in Section 310513.
- B. Fill Type A1 or A2: As specified in Section 310516.

PART 3 - EXECUTION

3.1 LINES AND GRADES

- A. Grades
 - 1. Pipes shall be laid true to the lines and grades indicated.
 - 2. The grade alignment of the pipe shall be maintained by the use of a string line parallel with the grade line and vertically above the centerline of the pipe. This line shall be established on level batter boards at intervals of not more than 25 feet. Batter boards shall span the trench and be rigidly anchored to substantial posts driven into the ground on each side of the trench. Three adjacent batter boards must be set before laying pipe to provide a check on the grades and line. Elevation and position of the string line shall be determined from the elevation and position of offset points or stakes located along the pipe route. Pipe shall not be laid using side lines for line or grade.
 - 3. As an alternative means of establishing alignment and grade, a "Laser-Beam" instrument may be utilized with a competent operator.
- B. Location of Pipe Lines:
 - 1. The location and approximate depths of the proposed pipe lines are shown on the drawings.
 - 2. The Engineer reserves the right to make changes in lines, grades, and depths of pipe lines and manholes when such changes are necessary.

3.2 PREPARATION

- A. Identify required lines, levels, contours, and datum locations.
- B. Protect plant life, lawns, and other features remaining as a portion of final landscaping.
- C. Protect bench marks, existing structures, fences, sidewalks, paving, and curbs from excavating equipment and vehicular traffic.
- D. Contractors attention is directed to the likelihood of encountering groundwater during trenching and excavation. Dewatering of trenches and excavated areas is required to provide dry construction conditions. Refer to the Geotechnical Report by S&ME, Inc.
- E. Maintain and protect above and below grade utilities which are to remain.
- F. Cut out soft areas of subgrade not capable of compaction in place. Uniformly place and compact Type A2 material to 98% (AASHTO T 180) under the observation of the Geotechnical Engineer's representative.

3.3 EXCAVATING

- A. Excavate subsoil required for utilities to tie-in location.

- B. Cut trenches sufficiently wide to enable installation and allow inspection. Remove water or materials that interfere with work.
- C. Do not interfere with 45 degree bearing splay of foundations.
- D. Hand trim excavation. Hand trim for bell and spigot pipe joints. Remove loose matter.
- E. Remove lumped subsoil, boulders, and rock up to 1/3 cubic yard, measured by volume.
- F. Correct areas over excavated areas with backfill and compact replacement as specified for authorized excavation.
- G. Stockpile excavated material in area designated on site and remove excess material not being used, from site.

3.4 TRENCHING

- A. Excavations:
 - 1. Excavation shall be dug so that the pipe can be laid and jointed properly. The trench shall be made so that the pipe can be laid to the alignment and depth as shown on the drawings, and it shall be excavated only so far in advance of pipe laying as permitted by the Engineer. The excavation shall not be more than 2 feet wider at the bottom than the outside diameter of the pipe or structure. If there is no interference with construction, or adjacent property, and if soil permits, the Contractor at his own expense shall be permitted to slope the side walls of the excavation starting at a point 2 feet above the top of pipe.
 - 2. The trench shall be excavated to the depth required so as to provide a uniform and continuous bearing and support for the pipe on bedding material at every point between joints, except where pipe slings or other lifting tackle are withdrawn.
 - 3. Excavation Below Grade:
 - a) Where excavation indicates that the subsurface materials at the bottom of the trench are in a loose or soft state, the Contractor shall be advised to excavate to a depth where suitable material is encountered, as directed by the Engineer.
 - b) Where the bottom of the trench has been excavated by mistake to a greater depth than required, the Contractor shall refill this area using Type A2 material. Refilling with earth to bring the bottom of the trench to the proper grade will not be permitted.
 - 4. Excavation within 24-inches of existing utilities shall be governed by specifications of the Owner of the respective utility. The Contractor shall obtain these specifications and follow the same at no extra cost.
- B. Trenching in Advance of Pipe Laying: Adequate protection of open trench shall be provided by the Contractor.

3.5 SHEETING AND BRACING

- A. General
 - 1. Sheeting and bracing of all excavations shall conform to the latest statutes of the State of South Carolina governing safety of workers in the construction industry. When necessary, in the opinion of the Engineer or Contractor, adequate sheeting and bracing shall be installed to prevent ground movement that may cause damage or settlement to adjacent structures, pipelines and utilities. Any damage due to settlement because of failure to use sheeting or because of inadequate

bracing, or through negligence or fault of the Contractor in any other manner, shall be repaired at the Contractor's expense.

2. Sides of trenches in unsuitable, loose or soft material, five feet or more in depth, shall be shored, sheeted, braced, sloped, or otherwise supported by means of sufficient strength to protect employees working within them.

B. Sheeting Requirements:

1. Where excavations are made with vertical sides which require supporting, the sheeting and bracing shall be of sufficient strength to sustain the sides of the excavations and to prevent movement which could in any way injure the work, or adjacent structures, or diminish the working space sufficiently to delay the work. Special precautions shall be taken where there is additional pressure due to the presence of other structures.
2. It shall be the Contractor's responsibility to select sheeting and bracing of sufficient dimensions and strength to adequately support the sides of trenches and excavations. The Contractor shall submit details of the sheeting and bracing he proposes to use to the Engineer for review.
3. Timber sheeting shall conform in quality to select structural Douglas Fir lumber and shall be sound, live timber, free from sap, large checks, shakes, loose or decayed knots, worm holes, and other imperfections which may impair its strength or durability.
4. In wet excavation grooved sheeting shall be used to prevent passage of soil. Any voids between sheeting and face of excavation shall be filled with suitable material rammed in place.
5. Sheeting and bracing shall be removed before the completion of the work.

3.6 BACKFILLING

- A. Backfill trenches to contours and elevations with unfrozen fill materials.
- B. Systematically backfill to allow maximum time for natural settlement. Do not backfill over porous, wet, frozen, or spongy subgrade surfaces.
- C. Soil Fill Type S1: Place and compact material in equal continuous layers not exceeding 6-inches compacted depth.
- D. Employ a placement method that does not disturb or damage, utilities in trench.
- E. Maintain optimum moisture content of fill materials to attain required compaction density.
- F. Remove surplus fill materials from site.
- G. Leave fill material stockpile areas completely free of excess fill materials.

3.7 TOLERANCES

- A. Top Surface of Backfilling under Paved Areas: Plus or minus 1-inch from required elevations.
- B. Top Surface of General Backfilling: Plus or minus 1-inch from required elevations.

3.8 FIELD QUALITY CONTROL

- A. Compaction testing will be performed in accordance with ASTM D698 or AASHTO T-180 as specified.

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- B. If tests indicate work does not meet specified requirements, remove work, replace, compact, and retest.
- C. Frequency of Tests: 1 test / 50 l.f. / 1-foot of backfill.

3.9 PROTECTION OF FINISHED WORK

- A. Reshape and re-compact fills subjected to vehicular traffic during construction.

3.10 SCHEDULE

- A. Storm Piping:
 - 1. Uniformly place and compact fill material type S1 in 6-inch max lifts, compacted to 98% standard proctor (ASTM D-698). The top 12-inches of fill material shall be compacted to 100% standard proctor in pavement sections.

END OF SECTION

SECTION 31 23 23

FILL

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes building perimeter and site structure backfilling to subgrade elevations; site filling and backfilling; fill under slabs-on-grade; fill under paving; fill for over-excavation; consolidation and compaction as scheduled.
- B. Related Sections:
 - 1. Section 310513 – Soils for Earthwork
 - 2. Section 312213 – Rough Grading.
 - 2. Section 329119 - Landscape Grading.
 - 3. Section 312317 - Trenching

1.2 REFERENCES

- A. ASTM D698 - Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures, Using 5.5 lb Rammer and 12-inch Drop.
- B. ASTM D1556 - Test Method for Density of Soil in Place by the Sand-Cone Method.
- C. ASTM D 2049 - Relative Density of Cohesionless Soils.
- D. ASTM D2167 - Test Method for Density and Unit Weight of Soil in Place by the Rubber Balloon Method.
- E. ASTM D2922 - Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).
- F. ASTM D3017 - Test Methods for Moisture Content of Soil and Soil-Aggregate Mixtures.

PART 2 - PRODUCTS

2.1 FILL MATERIALS

- A. Fill Type S1: As specified in Section 310513.
- B. Topsoil: As specified in Section 32 91 00 Planting Soil

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify subdrainage, dampproofing, or waterproofing installation has been inspected.

3.2 PREPARATION

- A. Compact subgrade to density requirements for subsequent backfill materials.
- B. Cut out soft areas of subgrade not capable of compaction in place. Backfill with Type S1 fill and compact to density equal to or greater than requirements for subsequent fill material.
- C. Scarify and proof roll subgrade surface to a depth of 12 inch to identify soft spots; fill and compact to density equal to or greater than requirements for subsequent fill material.

3.3 BACKFILLING

- A. Backfill areas to contours and elevations with unfrozen materials.
- B. Systematically backfill to allow maximum time for natural settlement. Do not backfill over porous, wet, frozen or spongy subgrade surfaces.
- C. Soil Fill Type S1: Place and compact material in equal continuous layers not exceeding 8 inches compacted depth.
- D. Employ a placement method that does not disturb or damage other work.
- E. Maintain optimum moisture content of backfill materials to attain required compaction density.
- F. Slope grade away from building minimum 2 inches in 10 ft, unless noted otherwise.
- G. Make gradual grade changes. Blend slope into level areas.
- H. Remove surplus backfill materials from site.
- I. Leave fill material stockpile areas free of excess fill materials.

3.4 TOLERANCES

- A. Top Surface of Backfilling Under Paved Areas: Plus or minus 1 inch from required elevations.
- B. Top Surface of General Backfilling: Plus or minus 1 inch from required elevations.

3.5 FIELD QUALITY CONTROL

- A. Compaction testing will be performed in accordance with ASTM D1556. ASTM D698. ASTM D2167. ASTM D2922. ASTM D3017. ASTM D2049.
- B. If tests indicate Work does not meet specified requirements, remove Work, replace and retest.
- C. Frequency of Tests: 1 test/2,000 sq. ft. of fill/2 ft. depth.
- D. Proof roll compacted fill surfaces under paving.

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3.6 PROTECTION OF FINISHED WORK

- A. Section 017000 – Project Closeout.
- B. Reshape and re-compact fills subjected to vehicular traffic.

3.7 SCHEDULE

- A. Interior Slab-On-Grade:
 - 1. Fill Type S1, compacted to 98 percent.
- B. Exterior Side of Foundation Walls:
 - 1. Fill Type S1, to subgrade elevation, each lift, compacted to 90 percent.
- C. Fill Under Grass Areas:
 - 1. Fill Type S1, to 6 inches below finish grade, compacted to 90 percent.
- D. Fill Under Landscaped Areas:
 - 1. Fill Type S1, to 12 inches below finish grade, compacted to 90 percent.
- E. Fill For Berming:
 - 1. Fill Type S1, to 12 inches below finish grade, compacted to 95 percent.
- F. Fill Under Asphalt Paving:
 - 1. Compact subsoil to 95 percent of its maximum dry density.
 - 2. Fill Type S1, to 12 inches below finish paving elevation, compacted to 98 percent.
- G. Fill to Correct Over-excavation:
 - 1. Fill Type S1, flush to required elevation, compacted to 98 percent.

END OF SECTION

SECTION 32 11 23

AGGREGATE BASE COURSES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes aggregate base course.
- B. Related Sections:
 - 1. Section 310513 – Soils for Earthwork
 - 2. Section 310516 – Aggregates for Earthwork
 - 3. Section 321313 – Concrete Paving.

1.2 REFERENCES

- A. AASHTO T180 (American Association of State Highway and Transportation Officials) - Moisture-Density Relations of Soils Using a 10-lb Rammer and an 18-inch Drop.
- B. ASTM D2167 - Test Method for Density and Unit Weight of Soil in Place by the Rubber Balloon Method.
- C. ASTM D2922 - Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).
- D. ASTM D3017 - Test Methods for Moisture Content of Soil and Soil-Aggregate Mixtures.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Aggregate Base Course: Conforming to South Carolina Department of Transportation Standards and Specifications, Section 305.

PART 3- EXECUTION

3.1 EXAMINATION

- A. Verify substrate has been inspected, gradients and elevations are correct, and is dry.

3.2 PREPARATION

- A. Correct irregularities in substrate gradient and elevation by scarifying, reshaping, and re-compacting.
- B. Do not place fill on soft, muddy, or frozen surfaces.
- C. Subgrade to be proof rolled using a heavily loaded dump truck under the supervision of a Geotechnical Engineer registered in the state of South Carolina, prior to placing Aggregate Base Course.

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3.3 AGGREGATE PLACEMENT

- A. Spread aggregate in lifts over prepared substrate to the total compacted thickness noted in plans.
- B. Place aggregate in maximum 6-inch layers and compact to specified density.
- C. Level and contour surfaces to elevations and gradients indicated.
- D. Add small quantities of fine aggregate to coarse aggregate as appropriate to assist compaction.
- E. Add water to assist compaction. If excess water is apparent, remove aggregate and aerate to reduce moisture content.
- F. Use mechanical tamping equipment in areas inaccessible to compaction equipment.

3.4 TOLERANCES

- A. Tolerances shall conform to South Carolina Department of Transportation Standards and Specifications, Section 305.

3.5 FIELD QUALITY CONTROL

- A. Testing Locations will be determined during construction by Owner or Owner's representative.
- B. Compaction testing will be performed in accordance with AASHTO T180
- C. If tests indicate work does not meet specified requirements, remove work, replace and retest.
- D. Frequency of Tests:
 - 1. Within concrete paved maintenance area: 2 tests
 - 2. Within asphalt paved access road: 3 tests

3.6 SCHEDULES

- A. Under Pavement Sections:
 - 1. Uniformly place and compact aggregate materials to 100% modified proctor per AAHSTO T180.

END OF SECTION

SECTION 32 12 16

FLEXIBLE PAVEMENT STRUCTURES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes asphaltic concrete paving and paint striping.
- B. Related Sections:
 - 1. Section 013000 – Project Administration
 - 2. Section 312213 – Rough Grading
 - 3. Section 321123 – Aggregate Base Course
 - 4. Section 321313 – Concrete Construction

1.2 REFERENCES

- A. South Carolina Department of Transportation Standard Specifications for Transportation Systems, 2007 Edition.

1.3 SUBMITTALS

Product Data: Submit product information and mix design to owner and engineer prior to paving.

1.4 QUALITY ASSURANCE

- 1. Perform Work in accordance with South Carolina of Transportation standards.
- 2. Mixing Plant: Conform to South Carolina Department of Transportation standards.
- 3. Obtain materials from same source throughout.
- 4. Maintain one copy of each document on site.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Asphalt Cement: In accordance with South Carolina Department of Transportation Standard Specifications Section 400 – Hot Mix Asphaltic Concrete Construction.
- B. Aggregate for Intermediate Course Mix: In accordance with South Carolina Department of Transportation Standard Specifications Section 401.
- C. Aggregate for Surface Course Mix: In accordance with South Carolina Department of Transportation Standard Specifications Section 401.
- D. Fine Aggregate: In accordance with South Carolina Department of Transportation Standard Specifications Sections 401.

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- E. Mineral Filler: In accordance with South Carolina Department of Transportation Standard Specifications Sections 401.
- F. Bituminous Tack Coat: In accordance with South Carolina Department of Transportation Standard Specifications Section 401 – Bituminous Tack Coat.
- G. Bituminous Prime Coat: In accordance with South Carolina Department of Transportation Standard Specifications Section 401 – Bituminous Prime Coat.

2.2 ASPHALT PAVING MIX

- A. Use dry material to avoid foaming. Mix uniformly.
- B. Binder Course: HMA Type C (3.0" Thick) - in accordance with South Carolina Department of Transportation Standard Specifications Section 402.
- C. Surface Course: Type C (2.0") – in accordance with South Carolina Department of Transportation Standard Specifications Section 403.

2.3 SOURCE QUALITY CONTROL AND TESTS

- A. Submit proposed mix design of each class of mix for review prior to beginning of Work.
- B. All asphalt compaction testing will be as per South Carolina Department of Transportation Standard Specifications. (See schedule at end of section)
- C. Frequency of Compaction Tests: Six (6) tests per each paving course along roadway section and two (2) tests per each paving course within each parking area, at locations directed by Owner. Provide compaction reports to owner and Engineer.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify gradients and elevations of base are correct.

3.2 PREPARATION - PRIME COAT

- A. Apply prime coat in accordance with South Carolina Department of Transportation Standard, Section 412.
- B. Application rate of prime coat: 0.20 gal/sy.

3.3 PREPARATION – TACK COAT

- A. Apply tack coat in accordance with South Carolina Department of Transportation Standard, Section 413.
- B. Application rate of tack coat: 0.05 gal/sy.

3.4 PLACING ASPHALT PAVEMENT

- A. Install Work in accordance with South Carolina Department of Transportation standards.
- B. Place to compacted thickness identified in schedule at end of section.
- C. Compact pavement by rolling to required density. Do not displace or extrude pavement from position. Hand compact in areas inaccessible to rolling equipment.
- D. Perform rolling with consecutive passes to achieve even and smooth finish without roller marks.
- E. Assure smooth transition from new pavement surface to existing pavement surface.

3.5 TOLERANCES

- A. All tolerances to conform to South Carolina Department of Transportation Standard Specifications.

3.6 PROTECTION OF FINISHED WORK

- A. Immediately after placement, protect pavement from mechanical injury for 24 hours or until surface temperature is less than 140 degrees F.

3.7 SCHEDULES

- A. Standard Duty Asphalt Pavement: Asphalt pavement section to consist of a 2.0" thick (Type C) SURFACE course, an 8.0" thick graded aggregate base course. Prime aggregate base course prior to pavement construction. Compact asphalt to 97% maximum density as determined by 2.0" thick (Type C) surface course Department of Transportation Testing Methods
- B. Heavy Duty Asphalt Pavement: Asphalt pavement section to consist of a 2.0" thick (Type C) SURFACE course, over a 3.0" thick (Type C) BINDER course over an 8.0" thick graded aggregate base course. Prime aggregate base course prior to pavement construction. Compact asphalt to 97% maximum density as determined by 2.0" thick (Type C) surface course Department of Transportation Testing Methods

END OF SECTION

SECTION 32 13 13

CONCRETE PAVING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Concrete paving for:
 - a. Concrete paving – Greenway Trail
 - b. Concrete Paving – Sidewalks, Paver Slabs,
 - c. Concrete curb and gutter.
- B. Related Sections: Soils
 - 1. Section 310513 – Soils for Earthwork
 - 2. Section 321123 - Aggregate Base Course.

1.2 REFERENCES

- A. American Association of State Highway and Transportation Officials:
 - 1. AASHTO M324 - Standard Specification for Joint and Crack Sealants, Hot Applied, for Concrete and Asphalt Pavements.
 - 2. AASHTO T180 (American Association of State Highway and Transportation Officials) – Moisture –Density Relations of Soils Using a 10-lb Rammer and an 18-inch Drop.
- B. American Concrete Institute:
 - 1. ACI 301 - Specifications for Structural Concrete.
 - 2. ACI 304 - Guide for Measuring, Mixing, Transporting, and Placing Concrete.
- C. ASTM International:
 - 1. ASTM A185 - Standard Specification for Steel Welded Wire Fabric, Plain, for Concrete Reinforcement.
 - 2. ASTM C31/C31M - Standard Practice for Making and Curing Concrete Test Specimens in the Field.
 - 3. ASTM C33 - Standard Specification for Concrete Aggregates.
 - 4. ASTM C39 - Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens.
 - 5. ASTM C94/C94M - Standard Specification for Ready-Mixed Concrete.
 - 6. ASTM C143/C143M - Standard Test Method for Slump of Hydraulic Cement Concrete.
 - 7. ASTM C150 - Standard Specification for Portland Cement.
 - 8. ASTM C172 - Standard Practice for Sampling Freshly Mixed Concrete.
 - 9. ASTM C173/C173M - Standard Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method.
 - 10. ASTM C231 - Standard Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method.
 - 11. ASTM C260 - Standard Specification for Air-Entraining Admixtures for Concrete.
 - 12. ASTM C494/C494M - Standard Specification for Chemical Admixtures for Concrete.

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13. ASTM C618 - Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use as a Mineral Admixture in Concrete.
14. ASTM C1116 - Standard Specification for Fiber-Reinforced Concrete and Shotcrete.
15. ASTM C1315 - Standard Specification for Liquid Membrane-Forming Compounds Having Special Properties for Curing and Sealing Concrete.
16. ASTM D1752 - Standard Specification for Preformed Sponge Rubber and Cork Expansion Joint Fillers for Concrete Paving and Structural Construction.
17. ASTM D6690 - Standard Specification for Joint and Crack Sealants, Hot Applied, for Concrete and Asphalt Pavements.

1.3 SUBMITTALS

- A. Product Data:
 1. Submit data on concrete materials, joint filler, and expansion joints.
- B. Design Data:
 1. Submit concrete mix design for each concrete strength. Submit separate mix designs when admixtures are required for the following:
 - a. Hot and cold weather concrete work.
 2. Identify mix ingredients and proportions, including admixtures.

1.4 QUALITY ASSURANCE

- A. Obtain cementitious materials from same source throughout.

1.5 PRE-INSTALLATION MEETINGS

- A. Convene minimum one week prior to commencing work of this section.

PART 2 - PRODUCTS

2.1 FORM MATERIALS

- A. Form Materials: As specified in South Carolina Department of Transportation Standard Specifications.

2.2 CONCRETE MATERIALS

- A. Concrete Materials: Provide in accordance with South Carolina Department of Transportation Standard Specifications.

2.3 CONCRETE MIX

- A. Concrete Paving "A" – Concrete Trail: Class 4000 structural concrete per South Carolina Department of Transportation Standard Specification Section 701.
- B. Concrete Paving "B" – Sidewalks, Paver Slabs: Class 3000 structural concrete per South Carolina Department of Transportation Standard Specification Section 701.

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- C. Concrete Curb and Gutter: Class 3000 Portland cement concrete per South Carolina Department of Transportation Standard Specifications Section 701.

2.4 ACCESSORIES

- A. Curing Compound: ASTM C309, Type 1, Class A.
- B. Joint Sealers: ASTM D6690, Type I; hot applied type.
- C. Expansion Joints: Provide per South Carolina Department of Transportation Standard Specifications Section 702.

2.5 SOURCE QUALITY CONTROL AND TESTS

- A. Submit proposed mix design to appointed firm for review prior to commencement of Work.
- B. Test samples in accordance with ASTM C94/C94M.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify compacted subgrade is dry and ready to support paving and imposed loads.
 - 1. Proof roll subgrade with fully loaded tandem truck to identify soft spots. Proof roll to be observed and documented by a Geotechnical Engineer registered in the State of South Carolina.
 - 2. Maintain and protect above and below grade utilities which are to remain.
- B. Verify gradients and elevations of base are correct.
- C. Coordinate concrete paving with structural retaining wall construction in advance.

3.2 BASE COURSE

- A. Aggregate Base Course: Uniformly place and compact as specified in Section 321123.

3.3 PREPARATION

- A. Moisten substrate to minimize absorption of water from fresh concrete.
- B. Notify Engineer minimum 48 hours prior to commencement of concreting operations.

3.4 FORMING

- A. Place and secure forms and screeds to correct location, dimension, profile, and gradient.
- B. Assemble formwork to permit easy stripping and dismantling without damaging concrete.

3.5 PLACING CONCRETE

- A. Place concrete in accordance with ACI 301.
- B. Place concrete continuously over the full width of the panel and between predetermined construction joints. Do not break or interrupt successive pours such that cold joints occur.

3.6 JOINTS

- A. Place expansion joints along face of building and other structures.
- B. Provide contraction joints as indicated on plans.

3.7 FINISHING

- A. Concrete Paving: Smooth and uniformly finish. Point or fill areas where cavities may have been produced near forms. Repair broken corners or edges.
- B. Curbs and Gutters: Light broom.
- C. Place curing compound on exposed concrete surfaces immediately after finishing.

3.8 CURING AND PROTECTION

- A. Immediately after placement, protect concrete from premature drying, excessively hot or cold temperatures, and mechanical injury.
- B. Maintain concrete with minimal moisture loss at relatively constant temperature for period necessary for hydration of cement and hardening of concrete.

3.9 FIELD QUALITY CONTROL

- A. Perform field inspection and testing in accordance with South Carolina Department of Transportation Standards and Specifications.
- B. Testing firm will take cylinders and perform slump tests in accordance with ACI 301.
- C. Strength Test Samples:
 - 1. Sampling Procedures: ASTM C172.
 - 2. Cylinder Molding and Curing Procedures: ASTM C31/C31M, cylinder specimens, standard cured.
 - 3. Sample concrete and make one set of 3 cylinders (min) for every 50 cu yds or less of each class of concrete placed each day.
 - 4. Make one additional cylinder during cold weather concreting, and field cure.
- D. Field Testing:
 - 1. Slump Test Method: ASTM C143/C143M.
 - 2. Air Content Test Method: ASTM C173/C173M.
 - 3. Temperature Test Method: ASTM C1064/C1064M.
 - 4. Measure slump and temperature for each compressive strength concrete sample.

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5. Measure air content in air entrained concrete for each compressive strength concrete sample.
- E. Cylinder Compressive Strength Testing:
1. Test Method: ASTM C39.
 2. Test one cylinder at 7-days.
 3. Test two cylinders at 28-days.
 4. Retain one cylinder for 56-days for testing when required by Geotechnical Engineer.
 5. Dispose remaining cylinders when testing is not required.
- F. Maintain records of placed concrete items. Record date, location of pour, quantity, air temperature, and test samples taken.

3.10 PROTECTION

- A. Immediately after placement, protect paving from premature drying, excessive hot or cold temperatures, and mechanical injury.
- B. Do not permit vehicular traffic over paving until 75% design strength of concrete has been achieved.

END OF SECTION

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CLAY PAVERS SECTION

PART 1

GENERAL 1.01 SECTION INCLUDES

- A. Clay paver units
- B. Sand setting bed and joint sand.

1.02 REFERENCES

A. American Society of Testing Materials (ASTM):

1. C902 Standard Specification for Pedestrian And Light Traffic Paving Brick
2. C1272 Standard Specification for Heavy Vehicular Paving Brick
3. C136 Method for Sieve Analysis for Fine and Coarse Aggregate.
4. C67 Method of Sampling and Testing Brick and Structural Clay Tile.
5. C33 Specification for Concrete Aggregates.
6. C144-89 Standard Specification for Aggregate for Masonry Mortar.

1.03 QUALITY ASSURANCE

A. Installation shall be by an installer with at least two years experience and who has installed at least 200,000 sq. Ft. of sand set pavers in commercial projects.

1.04 SUBMITTALS

- A. Submit shop or product drawings and product data.
- B. Submit samples of brick paving units to indicate color and size selections. Color will be selected by Architect/Engineer/Landscape Architect from manufacturer's available colors.
- C. Submit sieve analysis for grading of bedding and joint sand.
- D. Submit test results for compliance of paving unit requirements to ASTM C 902 or ASTM C 1272 from and independent testing laboratory.
- E. Submit installer qualifications: provide satisfactory evidence that the installer complies with the qualifications set out in section 1.03.
- F. Schedule & Work Plan: submit a detailed schedule and work plan

1.05 MOCK UPS A. Install a 10 ft. x 10 ft. paver area. This area will be used to determine joint sizes, lines, laying pattern(s), color(s), and texture of the job. This area shall be the standard from which the work will be judged.

1.06 DELIVERY, STORAGE AND HANDLING

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A. Deliver brick pavers to the site in steel banded, plastic banded, or plastic wrapped cubes or on pallets capable of transfer by fork lift or clamp lift. Unload pavers at job site in such a manner that no damage occurs to the product.

B. Sand shall be covered with waterproof covering to prevent exposure to rainfall or removal by wind. The covering shall be secured in place.

1.07 ENVIRONMENTAL CONDITIONS

A. Do not install sand or pavers during heavy rain or snowfall.

B. Do not install frozen sand.

PART 2 PRODUCTS

2.01 MANUFACTURED UNITS Brick pavers may have spacer bars on each unit (if "English Edge" paver is specified). These insure a minimum joint width between each unit in which the sand is placed. Spacer bars help prevent contact of the edges with adjacent pavers and subsequent chipping. Manually installed pavers may be installed with or without spacer bars.

A. Brick pavers shall be A Grade pavers manufactured/supplied by a member of the Brick Institute of America (BIA). The BIA manufacturer/supplier shall be: Name: Cherokee Brick Address: 3250 Waterville Rd. Macon, GA 31206 Phone: 800.277.2745

B. Product name/shape, overall dimensions, and thickness of the paver(s) used shall be:

Standard Pavers: Full Range Rumbled 3 5/8" x 7 5/8" x 2 1/4" (Color 1 on Plans)

Accent Field Pavers: Cocoa Tumbled 3 5/8" x 3 5/8" x 2 1/4" (Color 2 on Plans)

C. Pavers shall meet the following requirements set forth in ASTM C 902, Specification for Pedestrian and Light Traffic Paving Brick and shall conform to the PX standard.

1. Minimum average compressive strength of 10,000 psi.

2. The average cold water absorption shall not be greater than 6% with no individual unit testing greater than 7%. Absorption test results may not be achieved through the use of sealers or other products applied to the clay paver. (Sealer protection degrades over time requiring re-application after several years.)

3. Resistance of 50 freeze-thaw cycles, when tested in accordance with ASTM C67. In addition the clay paver must pass CSA-A231.2 freeze thaw test in saline solution without the use of sealers or other products applied to the paver. A test report must be submitted by the manufacturer. (Salt is the most common substance used for deicing during the winter months.)

4. Dimensional tolerances should meet the PX standard. The dimensional tolerances around the mean values for length, width, and depth shall be 1/16". (Studies show that dimensional tolerances are directly linked to joint width size and proper interlock.)

5. The pavers should be solid units without core holes or other perforations.

6. The contractor shall ensure that the manufacturer conducts a test sampling of 24 pavers every 50,000 pavers manufactured to determine the pavers compliance with dimensional and water absorption characteristics. The 24 paver sample shall be representative of the color mix in the typical finished

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package and chosen on a consistent basis from one kiln car. (Proper control procedures and testing are standard operating procedure for high quality manufacturers.)

2.02 BEDDING AND JOINT SAND

The type of sand used for bedding is often called concrete sand. Sands vary regionally. Contact paver installers local to the project and confirm sand(s) successfully used in previous similar applications.

- A. Bedding and joint sand shall be clean, non-plastic, free from deleterious or foreign matter. The sand shall be natural or manufactured from crushed rock. Grading of samples shall be done according to ASTM C136. The particles shall be sharp and conform to the grading requirements of ASTM C33 as shown in Table 1.

Table 1 Grading Requirements for Bedding and Joint

Sand Sieve Size	Percent Passing
3/8 in.	100
No. 4	95 to 100
No. 8	80 to 100
No. 16	50 to 85
No. 30	25 to 60
No. 50	10 to 30
No. 100	2 to 10

2.03 EDGE RESTRAINTS

- A. Edge restraints are required on all installations. Edge restraints are to be pre-cast or cast-in-place concrete, plastic, or steel as specified in the drawings. Install as per manufacturer's specifications.

2.04 JOINT SAND STABILIZERS

- A. Polymeric sand for paver joints shall be SmartSand, supplied by Techniseal, or approved equal.

2.05 GEOTEXTILE FABRIC

- A. The woven geotextile fabric shall be MIRAFI 700X supplied by Mirafi, Inc., Charlotte, NC or approved equal.

PART 3 EXECUTION

For installations on a compacted gravel base the subgrade shall be compacted to a minimum of 95% modified proctor density. Compacted aggregate shall be applied in even lifts of 4" and also compacted to a minimum of 95% modified proctor density. The specifier should be aware that the top surface of the pavers may be 1/8 to 1/4 inch above the final elevations after compaction. This difference in initial and final elevations is to compensate for possible minor settling.

3.01 EXAMINATION

- A. Verify that base is dry, uniform, even and ready to support sand, pavers and imposed loads.
- B. Verify gradients and elevations of base are correct.

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C. Verify location, type, installation and elevations of edge restraints around the perimeter area to be paved.

D. Beginning of installation means acceptance of base and edge restraints.

3.02 INSTALLATION

A. Provide edge restraints as indicated - install edge restraints prior to placing unit pavers.

B. Lay Filter Geotextile (if applicable) along edges where indicated in the drawings. Place geotextile over the compacted base course overlapping ends and edges at least 12 inches.

C. Spread the sand evenly over the base course and screed to 1 - 1 ½ inches thickness. The screeded sand should not be disturbed. Sufficient sand shall be placed to ensure that no delay occurs in laying pavers. The screeded bedding sand shall not be subjected to any traffic by either mechanical or pedestrian use.

D. Ensure that pavers are free of foreign material before installation. The installer shall take the pavers from the pallet by row consisting of 18 pavers. Each row shall be installed together to ensure proper color mix.

E. Lay the pavers in the pattern(s) as shown on the drawings. Full pavers are to be laid first. The pavers should be laid hand tight. Maintain straight pattern lines and adjust as necessary.

F. Joints between the pavers shall be between 1/16 inch and 1/8 inch (2 to 3 mm) wide.

G. Fill gaps at the edges of the paved area with cut pavers or edge units. Cut pavers to be placed along the edge using a masonry saw and in such a manner that no segment is smaller than one quarter of a full paver.

H. Use a low amplitude, high frequency plate vibrator capable of 3000 to 5000 lbs. centrifugal compaction force to vibrate the pavers into the sand. Vibrate the pavers, sweeping dry sand into the joints and vibrating until they are full. This will require at least two or three passes with the vibrator. Do not vibrate within three feet of the unrestrained edges of the paving units. (A plate vibrator is not recommended for straight edge pavers, instead use a hand tamp and board method for compaction)

I. All work to within three feet of the laying face must be left fully compacted with sand-filled joints at the completion of each day.

J. Sweep off excess sand when the job is complete. Contractor shall return to the site one month after installation is complete to inspect sand in joints. Contractor is responsible for adding additional sand to fill joints where necessary.

K. The final surface elevations shall not deviate more than 3/8 inch under a 10 foot long straight edge.

L. The surface elevation of pavers shall be 1/8 to 1/4 inch above adjacent drainage inlets, concrete collars or channels.

3.03 JOINT SAND STABILIZER APPLICATION (if applicable)

A. The surface shall be made clean and free from oil, dust from cutting and any loose material prior to the application of an epoxy joint sand stabilizer. (Any sand or dirt left on the pavers during

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sealing WILL BE SEALED TO THE PAVER. It is extremely difficult to correct this mistake!) The surface and joint sand shall be dry for its full depth prior to commencing work.

B. The treated area shall be protected from rain or moisture and shall not be trafficked for 24 hours after the completion of the stabilizer application Please consult the allied products section on our web site for information on joint sand stabilizers. Always follow the manufacturers recommendations for installation of these products.

C. After removal of excess sand, check final elevations for conformance to the drawings.

3.05 PROTECTION AND CLEAN UP

A. Protection:

1. Protect work from damage, discoloration and theft.
2. All vehicles and equipment operating on the completed pavers before and after application of the joint sand stabilizer shall be maintained in a clean condition, so that oil, tar, rubber or other matter is not deposited on the surface of the pavers or adjacent paving and features.

B. Clean up:

1. All materials generated by construction work in this section shall be removed at the end of each section of the work and the site shall be left in a clean and safe condition.
2. After completion of any repair work, clean all exposed surfaces with clean water and stiff brushes until all stains and dirt are removed. Use cleaning solutions only that are recommended by the paver and stabilizer manufacturers and do not use wire brushes.

3.06 MAINTENANCE

A. Repairs:

1. Repair or replace any damaged work to the original specified condition prior to handover.
2. Where lateral displacement of the pavers has occurred adjacent to edge restraints the cut pavers shall be replaced with new pavers of the correct size to comply with the specified joint widths and the surface shall be re-established.

B. Maintenance: The installer shall return to the site at the Owners request over a period of one year from handover to rectify any problems in the work caused by its failure to adequately align the pavers, compact the bedding sand or fill the joints.

END OF SECTION

SECTION 32 14 13

PAVERS SET IN MORTAR

PART 1 GENERAL

1.01 SUMMARY

- A. Section Includes
 - 1. Precast concrete paving slabs with grouted joints.
 - 2. Preparation of concrete base.
 - 3. Mortar bed.

1.02 REFERENCES

- A. American National Standards Institute (ANSI)
 - 1. American National Specifications for the Installation of Ceramic Tile.
- B. American Society for Testing and Materials (ASTM)
 - 1. C 140, Standard Test Methods for Sampling and Testing Concrete Masonry Units and Related Units.
 - 2. C 920, Specification for Elastomeric Joint Sealants.
 - 3. C 936, Specification for Solid Concrete Interlocking Paving Units.
 - 4. C 979, Standard Specification for Pigments for Integrally Colored Concrete.
 - 5. C 1645, Standard Test Method for Freeze-thaw and De-icing Salt Durability of Solid Concrete Interlocking Paving Units.

1.03 QUALITY ASSURANCE

- A. Installer Qualifications: Engage an experienced installer who has successfully completed mortar set unit paver installations similar in design, material, and extent indicated for this Project.
- B. Single-source Responsibility: Obtain each color, type, and variety of unit paving, joint materials and setting materials from single sources with resources to provide products and materials of consistent quality, appearance and physical properties without delaying progress of the Work.
- C. Field-constructed Mock-up: Prior to installation of pavers, erect mock-up(s) for each form and pattern of unit paver required. Build mock-up(s) using materials, base construction, expansion joints, and special features for contiguous work, as indicated for final unit of Work.

1.04 SUBMITTALS

- A. In accordance with Conditions of the Contract and Division 1 Submittal Procedures Section.
- C. Mortar color samples that indicate the extremes of color variation expected in the finished installation.
- D. Clay pavers:
 - 1. Four representative full-size samples of each paver type, thickness, color, finish that indicate the range of color variation and texture expected in the finished installation. Color(s) selected by Landscape Architect from manufacturer's available colors.
 - 2. Accepted samples become the standard of acceptance for the work.
 - 3. Test results from an independent testing laboratory for compliance of paving unit requirements to ASTM C 936.
 - 4. Manufacturer's certification of clay pavers by BIA as having met applicable ASTM standards.

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5. Manufacturer's catalog product data, installation instructions, and material safety data sheets for the safe handling of the specified materials and products.
- E. Paver Installation Subcontractor:
1. Job references from projects of a similar size and complexity. Provide Owner/Client/General Contractor names, postal address, phone, fax, and email address.
- 1.05 QUALITY ASSURANCE
- A. Paving Subcontractor Qualifications:
1. Utilize an installer having successfully completed concrete paver installation similar in design, material, and extent indicated on this project.
- C. Mock-Ups:
1. Install a 7 ft x 7 ft (2 x 2 m) paver area.
 2. Use this area to determine surcharge of the mortar bed, joint sizes, lines, laying pattern(s), color(s), and texture of the job.
 3. This area will be used as the standard by which the work will be judged.
 4. Subject to acceptance by owner, mock-up may be retained as part of finished work.
 6. If mock-up is not retained, remove and properly dispose of mock-up.
- 1.05 DELIVERY, STORAGE & HANDLING
- A. General: Comply with Division 1 Product Requirement Section.
- B. Comply with manufacturer's ordering instructions and lead-time requirements to avoid construction delays.
- C. Delivery: Deliver materials in manufacturer's original, unopened, undamaged containers packaging with identification labels intact.
1. Coordinate delivery and paving schedule to minimize interference with normal use of buildings adjacent to paving.
 2. Deliver clay pavers to the site in steel banded, plastic banded or plastic wrapped packaging capable of transfer by forklift or clamp lift.
 3. Unload pavers at job site in such a manner that no damage occurs to the product.
- D. Storage and Protection: Store materials protected such that they are kept free from mud, dirt, and other foreign materials.
1. Cover mortar sand with waterproof covering if needed to prevent exposure to rainfall or removal by wind. Secure the covering in place.
 2. Protect cementitious materials from moisture and freezing temperatures. Store in a dry location.
- 1.06 PROJECT/SITE CONDITIONS
- A. Environmental Requirements:
1. Do not install in rain or snow.
 2. Do not install over when outside temperature is below 45° F (5° C).
- 1.07 MAINTENANCE
- A. Extra Materials: Provide 5% total of material for use by owner for maintenance and repair.
- B. Pavers shall be from the same production run as installed materials.

PART 2 PRODUCTS

2.01 CLAY PAVERS

- A. Manufacturer: Cherokee Brick
 - 1. Contact: Cherokee Brick, 1984 Tobacco Rd. Augusta GA 30906, Cherokeebrick.com, 800-277-2745
- B. Clay Paver Units, including the following:
 - 1. Paver Type: Standard Modular Blank Paver
 - a. Material Standard: Comply with material standards in ASTM C 936.
 - b. Color: Velour Brown and Velour Flash.
 - c. Color Pigment Material Standard: Comply with ASTM C 979.
 - d. Size: 7 5/8 inches x 3 5/8 inches x 2 1/4 inches thick.

2.02 PRODUCT SUBSTITUTIONS

- A. Substitutions: No substitutions permitted.

2.03 MORTAR

- A. Mortar bed: Meets ANSI A118.4, Specifications for latex-Portland cement mortar.

2.04 ACCESSORIES

- A. Water: Potable and free from minerals or other materials that are detrimental to mortar and grout mixes.
- B. Primer: As recommended by the mortar material manufacturer.
- D. Mixes: Prepare pre-mix materials in accordance with manufacturer's written instructions.
- E. Edge Restraints: Provide edge restraints installed around the perimeter of all interlocking concrete paving unit areas as follows:
 - 1. Material: Cast in place concrete curb with or without mortared brick veneer.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Inspect areas and conditions under which work is to be performed and notify the Architect in writing of conditions detrimental to the proper and timely completion of the work.
- B. Verify that concrete base is sloped for drainage and is free of standing water, dust, oil, grease, paint, wax, curing compounds, primer, sealers, form release agents, or any deleterious substances and debris which may prevent or reduce bonding. Conduct moisture tests to verify that concrete surfaces are completely cured, free from hydrostatic pressure and having a moisture content of less than 5%.
- C. Verify that grout materials can be cleaned from pavers or provide coating to pavers to facilitate removal of grout materials.
- D. Do not proceed with the work until unsatisfactory conditions have been corrected by the General Contractor or designated subcontractor to the satisfaction of the installer.

3.02 PREPARATION

- A. Completely remove loose particles and debris from surface of concrete base. This may require mechanical grinding and scarifying of the surface.
- B. Neutralize any trace of strong acid or alkali from the substrate prior to mortar application.
- C. If leveling of the concrete surface is necessary, apply latex Portland cement mortar surface leveling materials to the surface of the substrate to bring the surface to a true, even plane. Allow mortar-leveling materials to set prior to installation.

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- D. Surface to receive mortar shall have a tolerance of $\pm 1/4$ in. (6 mm) over 10 ft (3m) for normal mortar setting bed applications.

3.03 INSTALLATION

- A. Moisten concrete base and apply slurry bond coat to concrete base per manufacturer's directions.
- B. Mix and apply mortar setting bed material in accordance with the manufacturer's instructions. Spread mortar in quantities that will remain plastic and workable during installation of pavers.
- C. Moisten the bottoms of the pavers prior to placing on mortar or thin-set materials.
- D. Lay pavers in pattern(s) on mortar bed as indicated on the drawings. Saw cut pavers as required with a masonry saw. Cut perimeter units no less than 1/4 of full-size units. Do not install stained, chipped, cracked, or broken pavers.
- E. Maintain 3/8 in. wide joints.
- F. Joints shall be uniform and straight in all both directions as indicated on the drawings.
- G. Lippage: maintain no greater than 1/16 in. (1.5 mm) height difference between adjacent pavers.
- H. Follow manufacturer's recommended times for setting mortar to cure before grouting.
- I. Maintain clean surfaces and joints prior to applying grout.
- J. Grout joints in accordance with ANSI A108.10.

3.04 EXPANSION AND CONTROL JOINTS

- A. Locate and obtain the approval of the Landscape Architect before commencing the installation.
- B. In accordance with TCA Detail No. EJ171, Handbook for Ceramic Tile Installation.
 - 1. Provide 40 feet within paver fields.
 - 2. Provide where dissimilar materials contact the pavers including walls, columns, and curbs.
 - 3. Carry completely through the assembly to surface.
 - 4. Keep clear of mortar setting materials and grout.
 - 5. Apply backer materials and sealant in joints.

3.05 CLEANING

- A. Clean pavers in accordance with the manufacturer's written recommendations.

3.06 FIELD QUALITY CONTROL

- A. The final surface tolerance from grade elevations shall not deviate more than $\pm 1/4$ in. (± 10 mm) under a 10 ft (3 m) straightedge.
- B. Check final surface elevations for conformance to drawings.

3.07 PROTECTION

- A. Protect finished work against weather, freezing and immersion in water for per mortar and grout manufacturer's recommendations.
- B. Protect pavers from construction-related foot traffic for at least 24 hours after completion of the installation and general foot traffic per the mortar and grout manufacturer's recommendations.
- C. Protect textured material during installation and afterwards. Cover and protect the textured surface from vehicular traffic during the construction period.
- D. After work in this section is complete, the General Contractor shall be responsible for protecting work from damage due to subsequent construction activity on the site.

END OF SECTION

SECTION 32 31 13

CHAIN LINK FENCES AND GATES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes fence framework, fabric, and accessories; excavation for post bases; concrete foundation for posts, and center drop for gates; and manual gates and related hardware.

1.2 REFERENCES

- A. ASTM A121 - Zinc-Coated (Galvanized) Steel Barbed Wire.
- B. ASTM A123 - Zinc (Hot Dip Galvanized) Coatings on Iron and Steel Products.
- C. ASTM A153 - Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
- D. ASTM A392 - Zinc-Coated Steel Chain-Link Fence Fabric.
- E. ASTM A824 - Metallic Coated Steel Marcellled Tension Wire for Use with Chain Link Fence.
- F. ASTM B429 - Aluminum-Alloy Extruded Structural Pipe and Tube.
- G. ASTM C94 - Ready-mixed Concrete.
- H. ASTM F567 - Practice for Installation of Chain-Link Fence.
- I. ASTM F668 - Poly (Vinyl Chloride) (PVC) Coated Steel Chain Link Fence Fabric.
- J. ASTM F900 - Industrial and Commercial Swing Gates.
- K. ASTM F934 - Standard Colors for Polymer-Coated Chain Link Fence Materials.
- L. ASTM F1043 - Strength and Protective Coatings on Metal Industrial Chain Link Fence Framework.
- M. ASTM F1083 - Pipe, Steel, Hot-Dipped Zinc-Coated (Galvanized) Welded, for Fence Structures.
- N. ASTM F1184 - Industrial and Commercial Horizontal Slide Gates.
- O. CLFMI (Chain Link Fence Manufacturers Institute) - Product Manual.

1.3 SYSTEM DESCRIPTION

- A. Fence Height: as indicated on Drawings.
- B. Line Post Spacing: At intervals not exceeding 10 feet.
- C. Fence Post and Rail Strength: Conform to ASTM F1043 Heavy Industrial Fence quality.

1.4 SUBMITTALS

- A. Section 013300 – Submittals: Submittal procedures.
- B. Shop Drawings: Indicate plan layout, spacing of components, post foundation dimensions, hardware anchorage, gates, and schedule of components.
- C. Product Data: Submit data on fabric, posts, accessories, fittings and hardware.
- D. Samples: Submit two samples of fence fabric, illustrating construction and colored finish.
- E. Manufacturer's Installation Instructions: Submit installation requirements for fence, and gate posts, fabrics, gates, PVC coatings, and accessories.

1.5 QUALITY ASSURANCE

- A. Supply material in accordance with CLFMI - Product Manual.
- B. The Architect/Engineer may inspect all fencing materials at the place of manufacture.
- C. Perform installation in accordance with ASTM F567.

1.6 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years documented experience, and with service facilities within 100 miles of Project.

1.7 DELIVERY, STORAGE AND HANDLING

- A. Fence fabric and accessories shall be delivered to the construction site in packed cartons or firmly tied rolls.
- B. Each package shall be identified and shall bear the manufacturer's name.
- C. Store fence fabric and accessories in a secure and dry place.

PART 2 - PRODUCTS

2.1 MATERIALS AND COMPONENTS

- A. Materials and Components: Conform to CLFMI Product Manual.
- B. Fabric Size: CLFMI Heavy Industrial
- C. Intermediate Posts: Type I round, II round, C rolled shape.
- D. Terminal, Corner, Rail, Brace, and Gate Posts: Type I, II round.

2.2 MATERIALS

- A. Framing (Steel): ASTM F1083 Schedule 40 galvanized steel pipe, welded construction, minimum yield strength of 25 ksi; coating conforming to ASTM F1043 Type A on pipe exterior and interior.
- B. Framing (Steel): ASTM A569; hot rolled steel strip, cold formed to pipe configuration, longitudinally welded construction, minimum yield strength of 50 ksi; coating conforming to ASTM F1043 Type B on pipe exterior and interior.
- C. Fabric Wire (Steel): ASTM A392 zinc coated wire fabric and ASTM F668 PVC coated.
- D. Concrete: Type specified in Section 321313.

2.3 COMPONENTS

For fabric height up to 6 feet:

- A. Line Posts: 1.90 inch diameter.
- B. Corner, End and Pull Posts: 2.38 inch diameter.
- C. Gate Posts: 3 inch diameter.
- D. Top and Brace Rail: 1.66 inch diameter with swedged-end or expansion-type coupling approximately 6 inches long for joining. Attach top rail securely to each gate corner, pull and end post using rail ends or other means.
- E. Gate Frame: 1.66 inch diameter for welded fitting and truss rod fabrication.
- F. Fabric: 2 inch diamond mesh interwoven wire, 9 guage thick, knuckle end closed, twisted tight, bottom selvage twisted tight.
- G. Tension Wire: 0.177 inch thick steel, single strand.
- H. Tension Band: 3/16 inch x 3/4 inch steel, zinc coated.
- I. Tension Strap: 3/16 inch x 3/4 inch steel, zinc coated.
- J. Tie Wire: Aluminum alloy steel wire, 9 guage.

For fabric height up to 6 feet to 12 feet:

- A. Line Posts: 3 inch diameter.
- B. Corner, End and Pull Posts: 3 inch diameter.
- C. Gate Posts: 3 inch diameter.
- D. Top and Brace Rail: 1.66 inch diameter with swedged-end or expansion-type coupling approximately 6 inches long for joining. Attach top rail securely to each gate corner, pull and end post using rail ends or other means.
- E. Gate Frame: 1.9 inch diameter for welded fitting and truss rod fabrication.

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- F. Fabric: 2 inch diamond mesh interwoven wire, 9 guage thick, knuckle end closed, twisted tight, bottom selvage twisted tight.
- G. Tension Wire: 0.177 inch thick steel, single strand.
- H. Tension Band: 3/16 inch x 3/4 inch steel, zinc coated.
- I. Tension Strap: 3/16 inch x 3/4 inch steel, zinc coated.
- J. Tie Wire: Aluminum alloy steel wire, 9 guage.

For fabric height up to 12 feet to 30 feet:

- A. Line Posts: 4 inch diameter.
- B. Corner, End and Pull Posts: 4 inch diameter.
- C. Top and Brace Rail: 1.66 inch diameter with swedged-end or expansion-type coupling approximately 6 inches long for joining. Attach top rail securely to each gate corner, pull and end post using rail ends or other means.
- D. Fabric: 2 inch diamond mesh interwoven wire, 9 guage thick, knuckle end closed, twisted tight, bottom selvage twisted tight.
- E. Tension Wire: 0.177 inch thick steel, single strand.
- F. Tension Band: 3/16 inch x 3/4 inch steel, zinc coated.
- G. Tension Strap: 3/16 inch x 3/4 inch steel, zinc coated.
- H. Tie Wire: Aluminum alloy steel wire, 9 guage.

2.4 ACCESSORIES

- A. Caps: Galvanized pressed steel; sized to post diameter, set screw retainer.
- B. Fittings: Sleeves, bands, clips, rail ends, tension bars, fasteners and fittings; galvanized steel.
- C. Gate Hardware: Center gate stop and drop rod, Mechanical keepers; three 180 degree gate hinges, non lift-off type, per leaf and hardware for padlock.

2.5 GATES

- A. General
 1. Gate types, opening widths and directions of operation shall be as shown on the Drawings.
 2. Gates shall conform to the requirements specified for PVC coated steel chain link fence except that PVC coated aluminum alloy framing conforming to ASTM B429 may be used.
 3. Gates shall be designed for operation by one person.

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- B. Swing Gates
 - 1. Swing gates shall be factory assembled, and shall swing 180 degrees.
 - 2. Gates shall conform to ASTM F900 except that framing shall be assembled by welding at the corners. Use of corner fittings shall not be permitted.

2.6 FINISHES

- A. Components and Fabric: Galvanized to ASTM A123; ASTM A153 for components; ASTM A392 for fabric; 1.8 oz/sq ft coating.
- B. Components and Fabric: Vinyl coating, black color in accordance with ASTM F934 over coating of 1.8 oz/sq ft galvanizing.
- C. Hardware: Galvanized to ASTM A153, 1.8 oz/sq ft coating.
- D. Accessories: Same finish as framing.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install framework, fabric, accessories and gates in accordance with ASTM F567.
- B. Place fabric on park side of posts and rails.
- C. Set intermediate, terminal, gate, and posts plumb, in concrete footings with top of footing unless otherwise shown on drawing 2 inches above. Slope top of concrete for water runoff.
- D. Line Post Footing Depth Below Finish Grade: ASTM F567; if not indicated on drawing, 3 feet minimum.
- E. Corner, Gate and Terminal Post Footing Depth Below Finish Grade: ASTM F567; if not indicated on drawing, 3 feet minimum.
- F. Brace each gate and corner post to adjacent line post with horizontal center brace rail and diagonal truss rods. Install brace rail one bay from end and gate posts.
- G. Provide top rail through line post tops and splice with 6 inch long rail sleeves.
- H. Install center and bottom brace rail on corner gate leaves.
- I. Do not stretch fabric until concrete foundation has cured 28 days.
- J. Stretch fabric between terminal posts or at intervals of 100 feet maximum, whichever is less.
- K. Position bottom of fabric 2 inches above finished grade.
- L. Fasten fabric to top rail, line posts, braces, and bottom tension wire with tie wire at maximum 12 inches on centers.
- M. Attach fabric to end, corner, and gate posts with tension bars and tension bar clips.

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- N. Do not attach the hinged side of gate from building wall; provide gate posts.
- O. Install gate with fabric to match fence. Install three hinges per leaf, latch, catches, drop bolt, foot bolts and sockets, retainer and locking clamp.
- P. Provide concrete center drop to footing depth and drop rod retainers at center of double gate openings.
- Q. Install fence with all posts vertical and all components to the line and grade shown on the Drawings.
- R. Excavate holes for posts to the diameter and spacing shown on the Drawings without disturbing the underlying materials.
- S. Center and align posts. Place concrete around posts, and vibrate or tamp for consolidation. Recheck vertical and top alignment of posts and make necessary corrections. Extend concrete footings 2 inches above grade, and trowel to a crown to shed water. Unless otherwise approved by the Architect/Engineer, no materials shall be installed on the posts, nor shall the posts be disturbed within 7 days after the individual post footing is completed.

3.2 ERECTION TOLERANCES

- A. Section 01400 - Quality Control: Tolerances.
- B. Maximum Variation From Plumb: ¼ inch.
- C. Maximum Offset From True Position: 1 inch.
- D. Components shall not infringe adjacent property lines.

END OF SECTION

AMERISTAR® PERIMETER SECURITY USA INC.

Montage II® - Heavy Industrial Steel Ornamental Fence System – Fusion Welded and Rackable CONSTRUCTION SPECIFICATION - SECTION 32 31 19

PART 1 - GENERAL

1.01 WORK INCLUDED

The contractor shall provide all labor, materials and appurtenances necessary for installation of the welded ornamental steel fence system defined herein at (specify project site).

1.02 RELATED WORK

Section ____ - Earthwork

Section ____ - Concrete

1.03 SYSTEM DESCRIPTION

The manufacturer shall supply a total fence system of Montage II® *Welded and Rackable* (ATF – All Terrain Flexibility) Ornamental Steel (specify Invincible™, Classic™, Majestic™, or Genesis™) design. The system shall include all components (i.e., panels, posts, gates and hardware) required.

1.04 QUALITY ASSURANCE

The contractor shall provide laborers and supervisors who are thoroughly familiar with the type of construction involved and materials and techniques specified.

1.05 REFERENCES

- ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy Coated (Galvannealed) by the Hot-Dip Process.
- ASTM B117 - Practice for Operating Salt-Spray (Fog) Apparatus.
- ASTM D523 - Test Method for Specular Gloss.
- ASTM D714 - Test Method for Evaluating Degree of Blistering in Paint.
- ASTM D822 - Practice for Conducting Tests on Paint and Related Coatings and Materials using Filtered Open-Flame Carbon-Arc Light and Water Exposure Apparatus.
- ASTM D1654 - Test Method for Evaluation of Painted or Coated Specimens Subjected to Corrosive Environments.
- ASTM D2244 - Test Method for Calculation of Color Differences from Instrumentally Measured Color Coordinates.
- ASTM D2794 - Test Method for Resistance of Organic Coatings to the Effects of Rapid Deformation (Impact).
- ASTM D3359 - Test Method for Measuring Adhesion by Tape Test.
- ASTM F2408 – Ornamental Fences Employing Galvanized Steel Tubular Pickets.

1.06 SUBMITTAL

The manufacturer's literature shall be submitted prior to installation.

1.07 PRODUCT HANDLING AND STORAGE

Upon receipt at the job site, all materials shall be checked to ensure that no damage occurred during shipping or handling. Materials shall be stored in such a manner to ensure proper ventilation and drainage, and to protect against damage, weather, vandalism and theft.

1.08 PRODUCT WARRANTY

A. All structural fence components (i.e. rails, pickets, and posts) shall be warranted within specified limitations, by the manufacturer for a period of 20 years from date of original purchase. Warranty shall cover any defects in material finish, including cracking, peeling, chipping, blistering or corroding.

B. Reimbursement for labor necessary to restore or replace components that have been found to be defective under the terms of manufacturer's warranty shall be guaranteed for five (5) years from date of original purchase.

PART 2 - MATERIALS

2.01 MANUFACTURER

The fence system shall conform to Montage II® *Welded and Rackable* (ATF – All Terrain Flexibility) Ornamental Steel, (specify Invincible™, Classic™, Majestic™, or Genesis™) design, (specify extended picket or flush) bottom rail treatment, (specify 2-Rail, 3-Rail or 4-Rail) style manufactured by Ameristar Fence Products, Inc., in Tulsa, Oklahoma.

2.02 MATERIAL

A. Steel material for fence panels and posts shall conform to the requirements of ASTM A653/A653M, with a minimum yield strength of 45,000 psi (310 MPa) and a minimum zinc (hot-dip galvanized) coating weight of 0.90 oz/ft² (276 g/m²), Coating Designation G-90.

B. Material for pickets shall be 1" square x 14 Ga. tubing. The rails shall be steel channel, 1.75" x 1.75" x .105". Picket holes in the rail shall be spaced 4.715" o.c. Fence posts and gate posts shall meet the minimum size requirements of Table 1.

2.03 FABRICATION

A. Pickets, rails and posts shall be pre-cut to specified lengths. Rails shall be pre-punched to accept pickets.

B. Pickets shall be inserted into the pre-punched holes in the rails and shall be aligned to standard spacing using a specially calibrated alignment fixture. The aligned pickets and rails shall be joined at each picket-to-rail intersection by Ameristar's proprietary fusion welding process, thus completing the rigid panel assembly (Note: The process produces a virtually seamless, spatter-free good-neighbor appearance, equally attractive from either side of the panel).

C. The manufactured panels and posts shall be subjected to an inline electrodeposition coating (E-Coat) process consisting of a multi-stage pretreatment/wash, followed by a duplex application of an epoxy primer and an acrylic topcoat. The minimum cumulative coating thickness of epoxy and acrylic shall be 2 mils (0.058 mm). The color shall be (specify Black or Bronze). The coated panels and posts shall be capable of meeting the performance requirements for each quality characteristic shown in Table 2 (Note: The requirements in Table 2 meet or exceed the coating performance criteria of ASTM F2408).

D. The manufactured fence system shall be capable of meeting the vertical load, horizontal load, and infill performance requirements for Industrial weight fences under ASTM F2408.

E. Swing gates shall be fabricated using 1.75" x 14ga Forerunner double channel rail, 2" sq. x 12ga. gate ends, and 1" sq. x 14ga. pickets. Gates that exceed 6' in width will have a 1.75" sq. x 14ga. intermediate upright. All rail and upright intersections shall be joined by welding. All picket and rail intersections shall also be joined by welding. Gusset plates will be welded at each upright to rail intersection. Cable kits will be provided for additional trussing for all gates leaves over 6'.

F. Pedestrian swing gates shall be self-closing, having a gate leaf no larger than 48" width. Integrated hinge-closer set (2 qty) shall be ADA compliant that shall include a variable speed and final snap adjustment with compact design (no greater than 5" x 6" footprint). Hinge-closer set (2 qty) shall be tested to a minimum of 500,000 cycles and capable of self-closing gates up to a maximum gate weight of 260 lbs. and maximum weight load capacity of 1,500 lbs. Hinge-closer device shall be externally mounted with tamper-resistant security fasteners, with full range of adjustability, horizontal (.5" - 1.375") and vertical (0 - .5"). Maintenance free hinge-closer set shall be tested to operate in temperatures of negative 20 F to 200 F degrees, and swings to negative 2 degrees to ensure reliable final lock engagement.

PART 3 - EXECUTION

3.01 PREPARATION

All new installation shall be laid out by the contractor in accordance with the construction plans.

3.02 FENCE INSTALLATION

Fence post shall be spaced according to Table 3, plus or minus 1/2". For installations that must be raked to follow sloping grades, the post spacing dimension must be measured along the grade. Fence panels shall be attached to posts with brackets supplied by the manufacturer. Posts shall be set in concrete footers having a minimum depth of 36" (Note: In some cases, local restrictions of freezing weather conditions may require a greater depth). The "Earthwork" and "Concrete" sections of this specification shall govern material requirements for the concrete footer. Posts setting by other methods such as plated posts or grouted core-drilled footers are permissible only if shown by engineering analysis to be sufficient in strength for the intended application.

3.03 FENCE INSTALLATION MAINTENANCE

When cutting/drilling rails or posts adhere to the following steps to seal the exposed steel surfaces; 1) Remove all metal shavings from cut area. 2) Apply zinc-rich primer to thoroughly cover cut edge and/or drilled hole; let dry. 3) Apply 2 coats of custom finish paint matching fence color. Failure to seal exposed surfaces per steps 1-3 above will negate warranty. Ameristar spray cans or paint pens shall be used to prime and finish exposed surfaces; it is recommended that paint pens be used to prevent overspray. Use of non-Ameristar parts or components will negate the manufactures' warranty.

3.04 GATE INSTALLATION

Gate posts shall be spaced according to the manufacturers' gate drawings, dependent on standard out-to-out gate leaf dimensions and gate hardware selected. Type and quantity of gate hinges shall be based on the application; weight, height, and number of gate cycles. The

manufacturers' gate drawings shall identify the necessary gate hardware required for the application. Gate hardware shall be provided by the manufacturer of the gate and shall be installed per manufacturer's recommendations.

3.05 CLEANING

The contractor shall clean the jobsite of excess materials; post-hole excavations shall be scattered uniformly away from posts.

Table 1 – Minimum Sizes for Montage II Posts			
<u>Fence Posts</u>		<u>Panel Height</u>	
2-1/2" x 12 Ga.		Up to & Including 6' Height	
3" x 12 Ga.		Over 6' Up to & Including 8' Height	
<u>Gate Leaf</u>	<u>Gate Height</u>		
	<u>Up to & Including 4'</u>	<u>Over 4' Up to & Including 6'</u>	<u>Over 6' Up to & Including 8'</u>
Up to 4'	2-1/2" x 12 Ga.	3" x 12 Ga.	3" x 12 Ga.
4'1" to 6'	3" x 12Ga.	4" x 11 Ga.	4" x 11 Ga.
6'1" to 8'	3" x 12 Ga.	4" x 11 Ga.	6" x 3/16"
8'1" to 10'	4" x 11 Ga.	6" x 3/16"	6" x 3/16"
10'1" to 12'	4" x 11 Ga.	6" x 3/16"	6" x 3/16"
12'1" to 14'	4" x 11 Ga.	6" x 3/16"	6" x 3/16"
14'1" to 16'	6" x 3/16"	6" x 3/16"	6" x 3/16"

Table 2 – Coating Performance Requirements		
<u>Quality Characteristics</u>	<u>ASTM Test Method</u>	<u>Performance Requirements</u>
Adhesion	D3359 – Method B	Adhesion (Retention of Coating) over 90% of test area (Tape and knife test).
Corrosion Resistance	B117, D714 & D1654	Corrosion Resistance over 1,500 hours (Scribed per D1654; failure mode is accumulation of 1/8" coating loss from scribe or medium #8 blisters).
Impact Resistance	D2794	Impact Resistance over 60 inch lb. (Forward impact using 0.625" ball).
Weathering Resistance	D822 D2244, D523 (60° Method)	Weathering Resistance over 1,000 hours (Failure mode is 60% loss of gloss or color variance of more than 3 delta-E color units).

Table 3 – Montage II – Post Spacing By Bracket Type										
Span	For INVINCIBLE® 8' Nominal (91-1/2" Rail)				For CLASSIC, GENESIS, & MAJESTIC 8' Nominal (92-5/8" Rail)					
	2-1/2"	3"	2-1/2"	3"	2-1/2"	3"	2-1/2"	3"	2-1/2"	3"
Bracket Type	Industrial Flat Mount (BB301)*		Industrial Line 2-1/2" (BB319) 3" (BB320)		Industrial Universal 2.5" (BB302) 3" (BB303)		Industrial Flat Mount (BB301)		Industrial Swivel (BB304)*	
Post Settings ± 1/2" O.C.	94-1/2"	95"	94-1/2"	95"	96"	96-1/2"	96"	96-1/2"	*96"	*96-1/2"

*Note: When using BB304 swivel brackets on either or both ends of a panel installation, care must be taken to ensure the spacing between post and adjoining pickets meets applicable codes. This will require trimming one or both ends of the panel. When using the BB301 flat mount bracket for Invincible style, rail may need to be drilled to accommodate rail to bracket attachment.

Section 32 32 23

Keystone Concrete Retaining Wall

(Base Bid)

Part 1: GENERAL

1.01 Description

- A. Work shall consist of designing, furnishing and construction of a KEYSTONE HARDSCAPES Harington 3 piece unit retaining wall system in accordance with these specifications and in reasonable close conformity with the lines, grades, design and dimensions shown on the plans. No alternate wall systems will be considered.
- B. Work includes preparing foundation soil, furnishing and installing leveling pad, unit facing system, unit drainage fill and reinforced backfill to the lines and grades shown on the construction drawings.
- C. Work includes furnishing and installing geogrid soil reinforcement of the type, size, location and lengths designated on the construction drawings.

1.02 Related Sections

- A. Section 31 00 00 – Earthwork

1.03 Reference Documents

- A. American Association of State Highway and Transportation Officials (AASHTO)
 - 1. AASHTO M 252 Corrugated Polyethylene Drainage Pipe
 - 2. AASHTO M 288 Geotextile Specification for Highway Applications
- B. American Society for Testing and Materials (ASTM)
 - 1. ASTM C140 Sampling and Testing Concrete Masonry Units
 - 2. ASTM C1372 Specification for Dry-Cast Segmental Retaining Wall Units
 - 3. ASTM D442 Particle Size Analysis of Soils
 - 4. ASTM D698 Laboratory Compaction Characteristics of Soil – Standard Effort
 - 5. ASTM D1556 Standard Test Method for Density and Unit Weight of Soil In Place by the Sand Cone Method
 - 6. ASTM D1557 Laboratory Compaction Characteristics of Soil – Modified Effort
 - 7. ASTM D2487 Standard Classification of Soils for Engineering Purposes (Unified Soil Classification System)
 - 8. ASTM D2922 Standard Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth)
 - 9. ASTM D3034 Standard Specification for Type PSM Poly (Vinyl Chloride) (PVC) Sewer pipe and Fittings
 - 10. ASTM D4318 Liquid Limit, Plastic Limit and Plasticity Index of Soils
 - 11. ASTM D4595 Standard Test Method for Tensile Properties of Geotextiles by Wide-Width Strip Method
 - 12. ASTM D4873 Standard Guide for Identification, Storage and Handling of Geosynthetics

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13. ASTM D5262 Standard Test Method for Evaluating the Unconfined Tension Creep Behavior of Geosynthetics
14. ASTM D5321 Standard Test Method for Determining the Coefficient of Soil and Geosynthetic or Geosynthetic and Geosynthetic Friction by the Direct Shear Method
15. ASTM D5818 Standard Practice for Obtaining Samples of Geosynthetics from a Test Section for Assessment of Installation Damage
16. ASTM D6637 Standard Test Method for Determining Tensile Properties of Geogrids by the Single or Multi-Rib Method
17. ASTM D6638 Standard Test Method for Determining Connection Strength Between Geosynthetic Reinforcement and Segmental Concrete Units
18. ASTM D6706 Standard Test Method for Measuring Geosynthetic Pullout Resistance in Soil
19. ASTM D6916 Standard Test Method for Determining the Shear Strength Between Segmental Concrete Units

1.04 Definitions

- A. Harington Unit – a dry-stacked concrete retaining wall unit machine made from Portland cement, water, aggregates, manufactured by a licensed manufacturer of Keystone.
- B. Structural Geogrid – a polymeric material formed by a regular network of connected tensile elements with apertures of sufficient size to allow interlocking with surrounding soil, rock or earth and function primarily as reinforcement.
- C. Unit Drainage Fill – drainage aggregate that is placed between and immediately behind the Keystone concrete units.
- D. Reinforced Backfill – compacted soil that is placed within the reinforced soil volume as outlined on the plans.
- E. Retained Soil – the soil mass behind the reinforced backfill.
- F. Foundation Soil – the soil mass below the leveling pad and reinforced backfill.
- G. Leveling Pad – crushed stone, sand and gravel or unreinforced concrete material placed to provide a level surface for placement of the Keystone concrete units.
- H. Geosynthetic Reinforcement – polymeric material designed specifically for soil reinforcement.

1.05 Submittals and Certification

- A. Contractor shall submit a Manufacturer's certification, prior to the start of work, that the retaining wall system components meet the requirements of this specification and the structure design.
- B. Contractor shall submit construction drawings and design calculations for the retaining wall system prepared and stamped by a Professional Engineer registered in the state of the project.

1.06 Quality Assurance

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- A. Contractor shall submit a list of five (5) previously constructed projects of similar size and magnitude by the wall installer where the Harington or similar retaining wall system has been constructed successfully. Contact names and phone numbers shall be listed for each project.
- B. Contractor shall provide evidence that the design engineer has a minimum of five years documented experience in the design of reinforced soil structures. The design engineer shall provide proof of current professional liability insurance with an aggregate coverage limit of not less than \$2,000,000.
- C. Owner shall/may provide quality assurance inspection and testing during earthwork and wall construction operations. Contractor shall provide all quality control testing and inspection not provided by the owner. Owner's quality assurance program does not relieve the contractor of responsibility for quality control and wall performance.

1.07 Delivery Handling and Storage

- A. Contractor shall check all materials upon delivery to assure that the proper type, grade, color, and certification have been received.
- B. Contractor shall protect all materials from damage due to jobsite conditions and in accordance with manufacturer's recommendations. Damaged materials shall not be incorporated into the work.

PART 2: PRODUCTS

2.01 Keystone Concrete Retaining Wall Units

- A. Harington 3 piece retaining wall units shall conform to the following architectural requirements
 1. Face color - SANDSTONE.
 2. Face finish - three piece hard split in a generally convex, rustic configuration. Other face finishes will not be allowed without written approval of Owner.
 3. Bond configuration - randomly utilize the various shapes to avoid repetition of the same unit size. Avoid stack bonding of unit joints for more than two courses in vertically adjacent units.
 4. Exposed surfaces of units shall be free of chips, cracks or other imperfections when viewed from a distance of 20 feet (6 m) under diffused lighting.
- B. Keystone concrete units shall conform to the requirements of ASTM C1372 - Standard Specifications for Segmental Retaining Wall Units.
- C. Keystone concrete units shall conform to the following structural and geometric requirements measured in accordance with ASTM C140 Sampling and Testing Concrete Masonry Units:
 1. Compressive strength: ≥ 3000 psi (21 MPa).
 2. Absorption: ≤ 8 % for standard weight aggregates.
 3. Dimensional tolerances: $\pm 1/8$ " (3 mm) from nominal unit dimensions not including rough split face.
 4. Unit Size: 6" (154 mm) (H) x 6" to 12" to 18" (152 to 457 mm) (W) approximate x 12" (304 mm)(D) minimum.
- D. Keystone concrete units shall conform to the following constructability requirements:

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1. Vertical setback: an integral shear connection flange/locator to provide a 1 1/8 inch (29 mm) ± setback per course, per the design.
2. Maximum horizontal gap between erected units shall be ≤ 1/2 inch (13 mm).

2.02 Base Leveling Pad Material

- A. Material shall consist of a compacted crushed stone base, sand and gravel or unreinforced concrete, as shown on the construction drawings.

2.03 Unit Drainage Fill

- A. Unit drainage fill shall consist of clean 1 inch (25 mm) minus crushed stone or crushed gravel meeting the following gradation tested in accordance with ASTM D-422:

<u>Sieve Size</u>	<u>Percent Passing</u>
1 inch (25 mm)	100
3/4-inch (19mm)	75 – 100
No. 4 (4.75 mm)	0 – 10
No. 50 (300 um)	0 - 5

- B. Drainage fill shall be placed between and behind the units as indicated on the design drawings.

2.04 Reinforced Backfill

- A. Reinforced backfill shall be free of debris and meet the following gradation tested in accordance with ASTM D-422:

<u>Sieve Size</u>	<u>Percent Passing</u>
1 1/2 inch (38 mm)	100
3/4-inch (19 mm)	75 – 100
No. 40 (425 um)	0 – 60
No. 200 (75 um)	0 – 35

Plasticity Index (PI) < 15 and Liquid Limit < 40, per ASTM D4318

- B. The maximum aggregate size shall be limited to 3/4 inch (19 mm) unless installation damage tests have been performed to evaluate potential strength reductions to the geogrid design due to increased installation damage during construction.
- C. Material can be site-excavated soils where the above requirements can be met. Soils not meeting the above criteria, including highly plastic clays and organic soils, shall not be used in the backfill or reinforced backfill soil mass.
- D. Contractor shall submit reinforced fill sample and laboratory test results to the Architect/Engineer for approval, prior to the use of any proposed reinforced backfill material.

2.05 Geogrid Soil Reinforcement

- A. Geosynthetic reinforcement shall consist of geogrids manufactured for soil reinforcement applications and shall be manufactured from high tenacity polyester yarn or high density polyethylene. Polyester geogrid shall be made from high tenacity polyester filament yarn with a molecular weight exceeded 25,000 g/m and with a carboxyl end group value less than 30. Polyester geogrid shall be coated with an impregnated PVC coating that resists peeling, cracking and stripping.

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- B. T_a – Long Term Allowable Tensile Design Load. T_a of the geogrid material shall be determined as follows: $T_a = T_{ult}/(RF_{cr} * RF_d * RF_{id} * FS)$. T_a shall be evaluated based on a 75 year design life.
1. T_{ult} – Short Term Ultimate Tensile Strength. T_{ult} shall be determined in accordance with ASTM D4595 or ASTM D6637. T_{ult} is based on the minimum average roll values (MARV).
 2. RF_{cr} – Reduction Factor for Long Term Tension Creep. RF_{cr} shall be determined from 10,000 hour creep testing performed in accordance with ASTM D5262. $RF_{cr} = 1.45$ minimum.
 3. RF_d – Reduction Factor for Durability. RF_d shall be determined from polymer specific durability testing covering the range of expected soil environments. $RF_d = 1.10$ minimum.
 4. RF_{id} – Reduction Factor for Installation Damage. RF_{id} shall be determined from product specific construction damage testing performed in accordance with ASTM D5818. Test results shall be provided for each product to be used with project specific or more severe soil types. $RF_{id} = 1.05$ minimum.
 5. FS – Overall Design Factor of Safety. FS shall be 1.5 unless noted for the maximum allowable working stress calculation.
- C. The maximum design tensile load of the geogrid shall not exceed the laboratory tested ultimate strength of the geogrid/facing unit connection divided by a factor of safety of 1.5. The connection strength testing and computation procedures shall be in accordance with ASTM D6638 Connection Strength between Geosynthetic Reinforcement and Segmental Concrete Units.
- D. C_i – Coefficient of Soil Interaction. C_i values shall be determined per ASTM D6706 at a maximum 0.75 inch (19 mm) displacement.
- E. The geogrid manufacturer shall have a Manufacturing Quality Control program that includes QC testing by an independent laboratory. The QC testing shall include Tensile Strength testing, Melt Flow Index testing for HDPE geogrids and Molecular Weight testing for polyester geogrids.

2.06 Drainage Pipe

- A. If required, drainage pipe shall be perforated or slotted PVC pipe manufactured in accordance with ASTM D3034 or corrugated HDPE pipe manufactured in accordance with AASHTO M252.

2.07 Geotextile Filter Fabric

- A. When required, geotextile filter fabric shall be a needle-punched nonwoven fabric that meets the requirements of AASHTO M288.

PART 3: EXECUTION

3.01 Excavation

- A. Contractor shall excavate to the lines and grades shown on the construction drawings. The Owner or Contractors QA/QC representative shall inspect the excavation and test the foundation soils and approve prior to placement of the leveling pad material or fill soils. Any over-excavation required to remove unsuitable soils shall be oversized from the front of the leveling pad and back of the geogrid reinforcement.
- B. Over-excavation and replacement of unsuitable soils and replacement with approved compacted fill will be compensated as agreed upon with the Owner.

3.02 Base Leveling Pad

- A. Leveling pad material shall be placed to the lines and grades shown on the construction drawings to a minimum thickness of 6 inches (150 mm) and extend laterally a minimum of 6 inches in front and behind the Keystone wall unit.
- B. Soil leveling pad materials shall be compacted to a minimum of 95% of Standard Proctor density per ASTM D697 or 92% Modified Proctor density per ASTM D1557.
- C. Leveling pad shall be prepared to insure full contact with the base surface of the concrete units.

3.03 Keystone Unit Installation

- A. First course of units shall be placed on the leveling pad at the appropriate line and grade. Alignment and level shall be checked in all directions and insure that all units are in full contact with the base and properly seated.
- B. Place the front of units side-by-side. Do not leave gaps between adjacent units. Layout of corners and curves shall be in accordance with manufacturer's recommendations.
- C. Place and compact drainage fill within and behind wall units. Place and compact reinforced backfill soil behind drainage fill.
- D. Maximum stacked vertical height of wall units, prior to drainage fill and backfill placement and compaction, shall not exceed one course.

3.04 Structural Geogrid Installation

- A. Geogrid shall be installed with the highest strength direction perpendicular to the wall alignment.
- B. Geogrid reinforcement shall be placed at the strengths, lengths and elevations shown on the construction drawings, or as directed by the engineer.

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- C. The geogrid shall be laid horizontally on compacted backfill and within 1 inch of the face of the units. Place the next course of Keystone units over the geogrid. The geogrid shall be pulled taut and anchored prior to backfill placement on the geogrid.
- D. Geogrid reinforcements shall be continuous throughout their embedment lengths and placed side-by-side to provide 100% coverage at each level. Spliced connections between shorter pieces of geogrid or gaps greater than 2 inches between adjacent pieces of geogrid are not permitted.

3.05 Reinforced Backfill Placement

- A. Reinforced backfill shall be placed, spread and compacted in such a manner that minimizes the development of slack in the geogrid and installation damage to the geogrid.
- B. Reinforced backfill shall be placed and compacted in lifts not to exceed 6 inches (150 mm) where hand operated compaction equipment is used, or 8 – 10 inches (200 to 250 mm) where heavy compaction equipment is used. Lift thickness shall be decreased to achieve the required density, as needed.
- C. Reinforced backfill shall be compacted to a minimum of 95% of Standard Proctor density per ASTM D697 or 92% Modified Proctor density per ASTM D1557. The moisture content of the reinforced backfill material during compaction shall be uniformly distributed throughout each layer and shall be dry of optimum by 0 to 3 percentage points of moisture.
- D. Only hand operated compaction equipment shall be allowed within 3 feet (1 M) from the back of the Keystone concrete units.
- E. Tracked construction equipment shall not be operated directly upon the geogrid reinforcement. A minimum fill thickness of 6 inches (150 mm) is required prior to operation of tracked vehicles over the geogrid. Tracked vehicle turning should be kept to a minimum to prevent tracks from displacing the fill and damaging or displacing the Keystone units or geogrid.
- F. Rubber tired equipment may pass over geogrid reinforcement at slow speeds, less than 10 MPH. Sudden braking and turning shall be avoided.
- G. At the end of each day's operation, the Contractor shall slope the last lift of reinforced backfill away from the wall units to direct runoff away from the wall face. The Contractor shall not allow surface runoff from adjacent areas to enter the wall construction site.

3.06 Cap Installation

- A. Prior to placement of the cap units, the upper surface of the top course of wall units shall be cleaned of soil and any other material.
- B. Cap units shall be adequately glued to the underlying wall units with an all-weather exterior construction adhesive.

3.07 As-built Construction Tolerances

- A. Vertical alignment: ± 1.5 inches (40 mm) over any 10 foot (3 m) distance.
- B. Wall batter: within 2 degrees of design batter. Overall wall batter shall be ≥ 0 degrees.
- C. Horizontal alignment: ± 1.5 inches (40 mm) over any 10 foot (3 m) distance.
- D. Corners and curves: ± 1 foot (300 mm) to theoretical location.

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- E. Maximum horizontal gap between erected units shall be \leq 1/2 inch (13 mm).

3.08 Field Quality Control

- A. Quality Assurance – The owner shall/may engage inspection and testing services, including independent laboratories, to provide quality assurance and testing services during construction. This does not relieve the Contractor from securing the necessary construction quality control testing.
- B. Quality assurance should include foundation soil inspection and testing and verification of the geotechnical design parameters and verification that the contractor’s quality control testing is adequate as a minimum. Quality assurance shall also include observation of the construction for general compliance with the design drawings and project specifications. Quality assurance is usually best performed by the site geotechnical engineer.
- C. Quality Control – The Contractor shall engage independent inspection and testing services to perform the minimum quality control testing described in the retaining wall design plans and specifications. Only qualified and experienced technicians and engineers shall perform quality control testing and inspection services.
- D. Quality control testing shall include soil and backfill testing to verify soil types and strengths, compaction and moisture conditions and verification that the retaining wall is being constructed in accordance with the design plans and specifications.

PART 4: MEASUREMENT AND PAYMENT

Specification For Segmental Retaining Wall System (Deductive Alternate #1)

Part 1: General

- 1.01 Description
Work shall consist of furnishing all materials, labor, equipment, and supervision to install a segmental retaining wall system to the lines, grades, design and dimensions shown on the plans, or as established by the owner or owner's engineer.
- 1.02 Related Work
- A. Section -Site Preparation
 - B. Section -Earthwork
- 1.03 Reference Standards
- A. NCMA Design Manual for Segmental Retaining Walls
 - B. ASTM C140-Sampling and Testing Concrete Masonry Units
 - C. ASTM D4595-Test Method of Tensile Properties of Geotextiles by the Wide-Width Strip Method
 - D. GRI-GG4-Determination of the Long Term Design Strength of Geosynthetics
- 1.04 Delivery, Storage and Handling
- A. The Contractor shall inspect the materials upon delivery to assure that the proper material has been received.
 - B. The Contractor shall store and handle materials so as to protect materials from damage. Damaged material shall not be incorporated into the segmental retaining wall.

Part 2: Materials

- 2.01 Concrete Segmental Retaining Wall (SRW) Units
- A. **RIDGE ROCK, BEVEL FACE, COLOR=BUFF:** SRW units shall be RidgeRock Retaining Wall Units as manufactured by RidgeRock Retaining Walls Inc.'s licensed producers.
 - B. Concrete segmental retaining wall units shall conform to the requirements of NCMA TEK 2-4 and have a minimum 28 days compressive strength strength of 3000 psi and a maximum absorption of 13 pcf as determined in accordance with ASTM C140. The units shall have adequate freeze/thaw protection and meet the requirements of ASTM C1262.
 - C. All SRW units shall be sound and free of cracks or other defects that would interfere with the placement or performance of the units.
 - D. SRW unit dimensions shall not differ more than $\pm 1/8$ inch, except for height, which shall not differ more than $\pm 1/16$ inch, as measured in accordance with ASTM C140.
 - E. Retaining wall units shall be interlocked by means of integral concrete

- lugs or other mechanical connection.
- F. Faces of retaining wall units shall be tri-surfaced with outer left and right surfaces being machined and center surface being rough textured from hard splitting. Imitation raked surfaces will not be permitted.
- G. Cap adhesive shall meet the requirements of the retaining wall supplier.
- 2.02 Geosynthetic Reinforcement
- A. Geosynthetic Reinforcement shall consist of those high strength geogrid or geotextiles designed for use in segmental retaining wall systems.
- B. The geosynthetic type, strength and placement shall be as shown on the plans. The design properties of the geogrid/segmental block system shall be determined by the procedures outlined in the Geosynthetic Research Institute, GRI-GG4, and NCMA SRWU-1.
- 2.03 Drainage Aggregate
- Drainage aggregate shall be a clean crushed stone or granular fill meeting the following gradation:

<u>Sieve Size</u>	<u>Percent Passing</u>
1 inch	100
3/4 inch	75-100
No. 4	0-60
No. 40	0-50
No. 200	0-5

- 2.4 Reinforced Backfill
- The reinforced backfill shall be free of debris, and consist of inorganic, low plasticity soil with a minimum angle of internal friction of 28°, and a liquid limit less than 50.
- 2.5 Drainage pipe
- A. The drainage collection pipe shall be perforated or slotted, PVC or corrugated HDPE pipe.
- B. Drainage pipe shall be manufactured in accordance with ASTM D 3034 and/or ASTM D 1248

Part 3: Installation

- 3.01 Excavation
- A. Contractor shall excavate to the lines and grades shown on the grading plans.
- 3.02 Foundation Preparation
- A. The foundation soil shall be excavated to the leveling pad dimensions indicated on the plans.
- B. The foundation soil shall be evaluated by the engineer to confirm the design bearing strength of the foundation soils. Soils not meeting the design bearing strength shall be replaced with suitable fill.

- 3.03 Leveling Pad Installation
- A. A minimum 6 inch thick layer of compacted granular material shall be placed as shown on the construction drawings.
 - B. The granular base shall be compacted to 95% of the maximum Standard Proctor density. The base shall be capable of providing a firm level bearing pad on which to place the first course of RidgeRock Segmental Retaining Wall Units.
- 3.04 Retaining Wall Unit Installation
- A. All materials shall be installed at the elevation and orientation shown on the plans.
 - B. The retaining wall units shall be installed adjacent to each other along the alignment of the wall.
 - C. Fill the RidgeRock Retaining Wall Units with drainage aggregate (Section 2.03).
 - D. Extend the drainage aggregate a minimum of 12 inches behind the retaining wall units.
 - E. Clean the top of the units so that they are free of aggregate.
 - F. Offset the second course of RidgeRock units, and pull them forward, so that the RidgeRock connector engages with the lower RidgeRock course. Repeat the above procedure until the proper height is achieved.
 - G. Terminate the end of the wall by turning the units at a radius into the embankment or tapering the top of wall with the desired slope.
- 3.05 Cap Unit Installation
- A. Place the Cap Unit over the last course of retaining wall units.
 - B. Saw cut block as needed.
 - C. Use a high strength cap adhesive to bond the cap unit to the wall.
- 3.06 Geosynthetic Installation
- A. Install the geosynthetic reinforcement at the elevations shown on the construction drawings.
 - B. The geosynthetic shall be installed by placing the primary strength direction of the product over the RidgeRock Unit (extended to the face of the unit), placing the next course of retaining wall units over the geosynthetic and pulling the geosynthetic taut. Anchor the end of the geosynthetic with pins or stakes to maintain tension prior to fill placement.
- 3.07 Backfill Placement
- A. The backfill shall be placed in maximum loose lift thicknesses of 10 inches, and compacted to 95% of Standard Proctor density (ASTM D 698) at a moisture within 2% of optimum.
 - B. Backfill shall be spread and compacted in such a manner that eliminates the development of slack in the geosynthetic.
 - C. Only hand operated compaction equipment shall be allowed within 3 feet of the front of the wall face.
 - D. Tracked construction equipment shall not operate directly upon the geosynthetic reinforcement. A minimum backfill thickness of 6 inches is

required prior to operation of tracked vehicles over the geosynthetic reinforcement. Turning of tracked vehicles shall be kept to a minimum to prevent fill and geosynthetic displacement.

- E. Rubber tired equipment may pass over the geosynthetic reinforcement at slow speeds less than 10 mph. Sudden braking and turning must be avoided.
- F. At the end of the day's operation, slope the backfill away from the wall to direct runoff away from the wall face. The contractor shall not allow surface runoff to enter the wall construction site.

3.08 Drainage Fill Placement

- A. The drainage fill shall be placed as directed on the construction plans.
- B. Install a minimum 3 inch drainage pipe behind the base of the wall to collect drainage from the drainage fill. The drainage collection pipe should daylight into a storm sewer manhole or along a slope at an elevation which is at a lower elevation than the lowest point within the aggregate drain.
- C. Drainage laterals shall be placed at a maximum of 50 feet spacing along the wall face.

Pre-Engineered Frame-Supported Shade Products

Part 1 – General

1.1 Related Documents

Drawings and general provisions of the Contract, including General Conditions and Division 1 Specifications Sections, apply to this section.

1.2 Summary

The shade structure contractor shall be responsible for design, engineering, fabrication and supply of the work specified herein. The intent of this specification is to have only one manufacturer be responsible for the aforementioned functions.

1.3 Submittals

1.3.1 Pre-Bid Submittals

- A. Provide proof of installed reference sites with structures for similar scope of project and installation that are engineered to International Building Code (IBC) specifications. Include in reference list of structure dimensions with install dates and project locations.
- B. Provide information to establish desired fabric color and powder coat color.
- C. Provide proof of all quality assurance items including:
 1. A list of at least six (6) public municipal installations where manufacturer's product as proposed pursuant to this bid has been installed and has been in continuous use for a minimum of five (5) years each.
 2. Proof of Liability and Umbrella Insurance.

1.3.2 Award of Contract Submittals

- A. Make available wet-sealed structural engineering drawings and calculations
- B. Provide fabric color and powder coat color selections for final order.

1.4 Project Conditions

- A. Field Measurements: verify layout information for shade structures shown on the drawings in relation to the property survey and existing structures. Verify locations by field measurements prior to construction.

1.5 Warranty

- A. The successful bidder shall provide a one (1) year warranty on all labor and materials.
- B. A supplemental non-prorated warranty from the manufacturer shall be provided for a period of ten (10) years on fabric including stitching and twenty (20) years on the structural integrity of the steel, from date of substantial completion.
- C. The warranty shall not deprive the Owner of other rights the Owner may have under the provisions of the Contract Documents, and will be in addition to, and run concurrent with, other warranties made by the Contractor under requirements of the Contractor documents.
- D. Because of surety requirements, any performance and payment bond that might be required will cover only the first year of the warranty. The manufacturer's warranty will be a separate document and will be executed at the time of completion of the work.

Part 2 – Products

2.1 General

The shade products shall be designed and manufactured to the most exacting specifications by skilled craftsmen, and certified by Professional Engineers for structural soundness of designs. All shade products are shipped knocked-down, with complete assembly instructions, and ready for easy in-field installation.

Bidder's products must be completely manufactured entirely in its own factory by its own employees, including powder-coating, thereby ensuring complete quality control. Bidder must certify that no aspect of its production – including powder-coating – is contracted out to third parties.

The proposed structure(s) manufactured by Shade Systems, Inc. or approved equal, shall be modular and pre-fabricated, and include the structural steel frame, fabric roof, steel cables and all fasteners.

- A. **Manufactured by: Shade Systems, Inc.**
4150 SW 19th Street Ocala, FL 34474
(800) 609-6066
(352) 237-2256 Fax
Jeremy Purkis
jeremy@shadesystemsinc.com
www.shadesystemsinc.com

B. Or Equal: Standard for approved equal. Ten (10) day prior approval required for substitution of product design, materials and features specified above. Submittals must include plans, drawings, cut sheets, material data sheets, testing results and samples. Bids failing to meet this requirement will be deemed non-responsive.

C. Structures are engineered to meet or exceed the requirements of International Building Code (IBC), and the following standard specifications:

Wind Speed (Frame only): 165 M.P.H.

Wind Speed (Frame w/canopy): 90 M.P.H.

Live Load: None

Snow Load: None

Optional designs with greater wind speeds, live loads, and snow loads are available.

D. Material: All materials shall be structurally sound and appropriate for safe use. Product durability shall be ensured by the use of corrosion-resistant metals such as stainless steel, and coatings such as zinc-plating, galvanizing, and powder-coating on steel parts, subject to the Product-Specific requirements. Fabrics used shall include UV-stabilizers and fire retardants for longevity and safety.

E. Packaging: All metal posts, rafters and beams shall be wrapped in plastic and cardboard to protect the powder coat finish during shipping.

F. Weldments: All tubing members are factory-welded by Certified Welders to American Welding Society (AWS) specifications and to the highest standards of quality workmanship. Weldments are finished with a zinc-rich galvanized coating. No field welding is required in the assembly of the shade products.

G. Posts, Structural Frame Tubing, and Hardware: All tubing used shall be cold-formed and milled per ASTM A-135 and ASTM A-500. Material testing is in accordance with ASTM E-8. Minimum yield is 40,000 psi with a minimum tensile strength of 45,000 psi on all posts. All tubing shall be pre-cut to appropriate lengths, and all outside surfaces shall be galvanized, with an interior corrosion-resistant zinc-rich coating. Where required, support pipes shall be schedule 40 hot-dip galvanized or powder-coated black steel. All fastening hardware shall be stainless steel.

H. Polyester Powder-coating Process: All powder-coated parts are completely cleaned and a hot zinc phosphate pretreatment with non-chromic sealer is applied. Powder-coating is then electrostatically applied and oven-cured at 375 to 425 degrees Fahrenheit. Polyester powders shall meet or exceed ASTM standards for Adhesion, Hardness, Impact, Flexibility, Overbake Resistance, and Salt Spray Resistance. Colors shall be specified.

- I. Standard Footings: Footings shall be designed per stringent International Building Code (IBC) for the specified structure. Columns will be provided as standard direct embedment. Other footing designs are available.
- J. Roofing: Structural frames are designed by Shade Systems only for use with Coolnet™ polyethylene shade fabric. Fabric is attached to frame using a vinyl covered minimum ¼” diameter stainless steel and clear vinyl coated cable. Cable fasteners are zinc-plated copper for maximum corrosion resistance.

2.2 Fastening System

- A. Coolnet™ Shade Fabric shall be delivered complete with independent cables pre-inserted in fabric hems. Each cable shall be looped and clamped at each end. Fastening System to consist of the Turn-N-Slide™ fastening device which is factory installed at each roof rafter corner. The Turn-N-Slide features a concealed mechanism which allows the attachment hook and sleeve at each rafter corner to move along a track in the rafter. Cables are attached to hook which is welded to the moving sleeve, thereby distributing tension evenly over rafters and not directly onto the mechanism. Rafters are sealed with no penetrations on the top side, thereby preventing water from entering. Such moving sleeve with hook allows the looped ends of each cable to slide over the hook when the sleeve is at its upper position, and then by turning the concealed fastener within the rafter, moves the sleeve with hook outward (toward end of rafter), thereby tensioning the cables and securing the fabric at the proper tautness. A locking cap is secured at the end of each rafter with a vandal-resistant bolt (special wrench provided by the manufacturer) to prevent unauthorized access to the Turn-N-Slide mechanism. To remove the canopy, the cap is removed, and the mechanism rotated counter- clockwise. The sleeve with hook moves inward (toward peak of roof), thereby de-tensioning the cables, and allows fast removal of the canopy. Continuous one-piece cables, cables which are not independent per side and pre-looped and clamped at the factory, and/or cables which must be tensioned with the use of turnbuckles or tools not provided by the manufacturer are not acceptable. Structures which do not feature the Fastening Mechanism on each and every rafter, or fastening mechanisms which do not feature a sealed top rafter and moving outer sleeve such as the Turn-N-Slide, are not acceptable.
- B. Fastening System Instructional Video: Product must be delivered complete with a minimum 5-minute instructional video on DVD media. Video must show the viewer the exact procedure for removing and re-attaching canopy using an actual shade structure in the field. Submittals which do not include the video on DVD media are not acceptable.

2.3 Fabric

- A. Shade Fabric: Knitted of monofilament and tape construction high density polyethylene with Ultra-Violet (U.V.) stabilizers and flame retardant. UV- Block Factor varies by standard color offered from 91% to 99%.

Normal Thickness: 0.057 inches

Fabric Mass: Min 340 g/m²

Light Fastness: 7-8 (Blue Wool Scale)

Weather Fastness: 4-5 (Grey Scale Test)

Tear Resistance: Warp 210N Weft 276N

Breaking Force: Warp 786N Weft 2494N

Bursting Pressure: Mean 3500kPa

Bursting Force: Mean 2146N

All hems and seams are double row lock stitched using exterior grade UV- stabilized polyethylene GORE™ TENARA™ sewing thread (GORE and TENARA are trademarks of W.L. Gore & Associates).

- A. Flammability: Shade Fabric is treated with fire retardants and passes requirements established under the NFPA 701 Test Method 2 test standards for flammability, including the accelerated water leaching protocol. Written evidence of compliance with this standard, including with accelerated water leaching protocol, must be furnished with bid proposal.

Color	Weight (g/m ²)	Shade Factor %	UVR Block %
Canary Yellow	340	77	93
Eggshell White	340	79	95
Lime Green	400	87	94
Fire Orange	400	82	94
Onyx Black	340	97	97
Grape Purple	400	82	90
Desert Sand	340	84	95
Rivergum Green	340	86	93
Bright Red	340	81	91
Brick Red	340	95	94
Silver Grey	340	92	97
Light Blue	340	95	97
Navy Blue	340	96	99
Aquatic Blue	340	88	94
Forest Green	340	96	97

Part 3 – Execution

3.1 Installation

Installations of shade structure(s) shall be performed by an installer who shall comply with the manufacturer's instructions for assembly, installation, and erection, per approved drawings.

A. Concrete

- 1 Concrete work shall be executed in accordance with the latest edition of the American Concrete Building Code, ACI 318.
- 2 All reinforcement shall conform to ASTM A-615, Grade 60.
- 3 Reinforcing steel shall be detailed, fabricated, and placed in accordance with the latest ACI Detailing Manual, and Manual of Standard Practice.

Pre-Engineered Sail Shade Products

Part 1 – General

1.1 Related Documents

Drawings and general provisions of the Contract, including General Conditions and Division 1 Specifications Sections, apply to this section.

1.2 Summary

The shade structure contractor shall be responsible for design, engineering, fabrication and supply of the work specified herein. The intent of this specification is to have only one manufacturer be responsible for the aforementioned functions.

1.3 Submittals

1.3.1 Pre-Bid Submittals

- A. Provide proof of installed reference sites with structures for similar scope of project and installation that are engineered to International Building Code (IBC) specifications. Include in reference list of structure dimensions with install dates and project locations.
- B. Provide information to establish desired fabric color and power coat color.
- C. Provide proof of all quality assurance items including:
 - 1. A list of at least three (3) reference projects that have been installed a minimum of five (5) years.
 - 2. Proof of Liability and Umbrella Insurance.

1.3.2 Award of Contract Submittals

- A. Provide structural shop drawings drawings.
- B. Provide fabric color and powder coat color selections for final order.

1.4 Project Conditions

Pre-Engineered Shade Structures

Page 1 of 6

Because of our commitment to continuous product development and improvement, we reserve the right to change specifications at any time without notice.

- A. Field Measurements: verify layout information for shade structures shown on the drawings in relation to the property survey and existing structures. Verify locations by field measurements prior to construction.

1.5 Warranty

- A. The successful bidder shall provide a one (1) year warranty on all labor and materials.
- B. A supplemental non-prorated warranty from the manufacturer shall be provided for a period of ten (10) years on fabric including stitching and twenty (20) years on the structural integrity of the steel, from date of substantial completion.
- C. The warranty shall not deprive the Owner of other rights the Owner may have under the provisions of the Contract Documents, and will be in addition to, and run concurrent with, other warranties made by the Contractor under requirements of the Contractor documents.
- D. Because of surety requirements, any performance and payment bond that might be required will cover only the first year of the warranty. The manufacturer's warranty will be a separate document, and will be executed at the time of completion of the work.

Part 2 – Products

2.1 General

The shade products shall be designed and manufactured to the most exacting specifications by skilled craftsmen, and certified by Professional Engineers for structural soundness of designs. All shade products are shipped knocked-down, with complete assembly instructions, and ready for easy in-field installation.

Bidder's products must be completely manufactured entirely in its own factory by its own employees, including powder-coating, thereby ensuring complete quality control. Bidder must certify that no aspect of its production – including powder-coating – is contracted out to third parties.

The proposed structure(s) manufactured by Shade Systems, Inc. or approved equal, shall be modular and pre-fabricated, and include the structural steel frame, fabric roof, steel cables and all fasteners.

- A. **Manufactured and Distributed by:**
Shade Systems, Inc.
4150 SW 19th Street
Ocala, FL 34474
(800) 609-6066 Phone
(352) 237-2256 Fax
Jeremy Purkis
jeremy@shadesystemsinc.com
www.shadesystemsinc.com
- B. Or approved equal. Ten (10) day prior approval required for substitution of product design, materials and features specified above. Submittals must include plans, drawings, cut sheets, material data sheets, testing results and samples. Bids failing to meet this requirement will be deemed non-responsive.
- C. Structures are engineered to meet or exceed the requirements of International Building Code (IBC), and the following standard specifications:
- | | |
|------------------------------|------------|
| Wind Speed (Frame only): | 165 M.P.H. |
| Wind Speed (Frame w/canopy): | 90 M.P.H. |
| Live Load: | None |
| Snow Load: | None |
- Optional designs with greater wind speeds, live loads, and snow loads are available.*
- D. Material: All materials shall be structurally sound and appropriate for safe use. Product durability shall be ensured by the use of corrosion-resistant metals such as stainless steel, and coatings such as zinc-plating, galvanizing, and power-coating on steel parts, subject to the Product-Specific requirements. Fabrics used shall include UV-stabilizers and fire retardants for longevity and safety.
- E. Weldments: All tubing members are factory-welded by Certified Welders to American Welding Society (AWS) specifications and to the highest standards of quality workmanship. Weldments are finished with a zinc-rich galvanized coating. No field welding is required in the assembly of the shade products.
- F. Posts, Structural Frame Tubing, and Hardware: All tubing used shall be cold-formed and milled per ASTM A-135 and ASTM A-500. Material testing is in accordance with ASTM E-8. Minimum yield is 40,000 psi with a minimum

tensile strength of 45,000 psi on all posts. Support pipes shall be schedule 40 black steel with appropriate pre-treatment for powder-coating. All fastening hardware shall be stainless steel.

- G. Polyester Powder-coating Process: All powder-coated parts are completely cleaned and a hot zinc phosphate pretreatment with non-chromic sealer is applied. Powder-coating is then electrostatically applied and oven-cured at 375 to 425 degrees Fahrenheit. Polyester powders shall meet or exceed ASTM standards for Adhesion, Hardness, Impact, Flexibility, Overbake Resistance, and Salt Spray Resistance. Colors shall be specified.
- H. Standard Footings: Footings shall be designed per stringent International Building Code (IBC) for the specified structure. Columns will be provided as standard direct embedment. Other footing designs are available.
- I. Roofing: Sails are designed by Shade Systems only for use with polyethylene shade fabric. Fabric is attached to posts using the Fastening Systems below in conjunction with vinyl covered minimum ¼" diameter stainless steel cables. Cable fasteners are zinc-plated copper for maximum corrosion resistance.

2.2 Fastening System

CoolNet™ Shade Fabric shall be delivered complete with fastening system installed. Fastening System to consist of factory-formed stainless steel tensioning plates pre-attached to fabric canopies at each corner, and cables per the above hemmed into the fabric at the factory and terminating in the bracket. Posts shall be equipped with an adjustable 360-degree swivel and pivot attachment mechanism to which the tensioning plate fastens. Tensioning plate includes a stainless steel adjustment bolt which, when turned, tensions the fabric for a taut fit. Fabrics, cables, and brackets which are not pre-assembled at the factory are not acceptable. Cables which attach to posts with u-bolts or 'S' hooks, and which do not use a stainless steel bracketing system similar to the above are not acceptable.

2.3 Fabric

- A. Shade Fabric: Knitted of monofilament and tape construction high density polyethylene with Ultra Violent (U.V.) stabilizers and flame retardant. UV-Block Factor varies by standard color offered from 91% to 99%.

Normal Thickness:	0.057 inches
Fabric Mass:	Min 340 g/m ²
Light Fastness:	7-8 (Blue Wool Scale)
Weather Fastness:	4-5 (Grey Scale Test)
Tear Resistance:	Warp 210N Weft 276N
Breaking Force:	Warp 786N Weft 2494N
Bursting Pressure:	Mean 3500kPa
Bursting Force:	Mean 2146N

All hems and seams are double row lock stitched using exterior grade UV-stabilized polyethylene GORE™ TENARA™ sewing thread (GORE and TENARA are trademarks of W.L. Gore & Associates).

- B. Flammability: Shade Fabric is treated with fire retardants and passes requirements established under the NFPA 701 Test Method 2 test standards for flammability, including the accelerated water leaching protocol. Written evidence of compliance with this standard, including with accelerated water leaching protocol, must be furnished with bid proposal.

Color	Weight (g/m ²)	Shade Factor %	UVR Block %
Canary Yellow	340	77	93
Eggshell White	340	79	95
Lime Green	400	87	94
Fire Orange	400	82	94
Onyx Black	340	97	97
Grape Purple	400	82	90
Desert Sand	340	84	95
Rivergum Green	340	86	93
Bright Red	340	81	91
Brick Red	340	95	94
Silver Grey	340	92	97
Light Blue	340	95	97
Navy Blue	340	96	99
Aquatic Blue	340	88	94
Forest Green	340	96	97

Part 3 – Execution

3.1 Installation

Installations of shade structure(s) shall be performed by an installer who shall follow the manufacturer's instructions for assembly, installation, and erection, per approved drawings.

A. Concrete

1. Concrete work shall be executed in accordance with the latest edition of the American Concrete Building Code, ACI 318.
2. All reinforcement shall conform to ASTM A-615, Grade 60.
3. Reinforcing steel shall be detailed, fabricated, and placed in accordance with the latest ACI Detailing Manual, and Manual of Standard Practice.

SECTION 32 84 00

PLANTING IRRIGATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes the design and installation of the valves, piping, sprinklers, accessories, controls, and wiring for lawn and shrubbery irrigation systems. See landscape plan for location of water source, backflow (by others) and proposed controller.

1.3 DEFINITIONS

- A. Pipe sizes used in this Section are nominal pipe size (NPS) in inches. Tube sizes are Standard size in inches. Equivalent SI (metric) sizes are indicated in millimeters (mm) in parentheses.
- B. Supply Piping: Piping from water source to connection to irrigation system pressure piping. Piping is under same pressure as water supply. Piping in this category is not included in this Section.
- C. Pressure Piping: Piping downstream from supply piping to and including control valves. Piping is under irrigation system pressure. Piping in this category includes pressure regulators, water meters, and backflow preventers, when used.
- D. Circuit Piping: Piping downstream from control valves to irrigation system sprinklers. Piping is under pressure (less than pressure piping) during flow.
- E. Control Valve: Manual or automatic (electrically operated) valve for control water flow to irrigation system zone.

1.4 SYSTEM PERFORMANCE REQUIREMENTS

- A. Design of Sprinklers and Devices: System shall be designed so that all areas shall receive head to head coverage. **Turf areas shall be zoned separately from shrubs areas.** Avoid plantings and obstructions such as signs and light standards.
- B. Minimum Water Coverage: Not less than the following on all proposed turf, trees and shrubs indicated to be irrigated:
 - 1. Turf Areas: 100 percent.
 - 2. Planting Beds: 100 percent.

SECTION 32 84 00

PLANTING IRRIGATION

1.5 SUBMITTALS

- A. General: Submit the following according to the Conditions of the Contract.
- B. Proposed design drawings showing irrigation system, including plan layout and locations, types, sizes, capacities, and flow characteristics of irrigation system components. Include water meters, backflow preventers, valves, piping, sprinklers and devices, accessories, controls, and wiring.
- C. Product data including pressure rating, rated capacity, settings, and electrical data of selected models for the following:
 - 1. Pressure regulators.
 - 2. Valves, including general-duty, underground, manual and automatic control, and quick-coupler types, and valve boxes.
 - 3. Sprinklers, including emitters, drip tubes, and devices.
 - 4. Controls, including controller wiring diagrams.
 - 5. Wiring.
- D. Maintenance data for inclusion in "Operating and Maintenance Manual" specified in Division 1 Section "Project Closeout" for the following:
 - 1. Pressure regulators.
 - 2. Automatic control valves.
 - 3. Sprinklers.
 - 4. Controllers.

1.6 QUALITY ASSURANCE

- A. Comply with requirements of utility supplying water for prevention of backflow and backsiphonage.
- B. Comply with requirements of authority with jurisdiction for irrigation systems.
- C. Designer Qualifications: Engage an experienced Designer who has completed irrigation systems similar in material, design, and extent to that indicated for Project that have resulted in construction with a record of successful in-service performance.
- D. Installer Qualifications: Engage an experienced Installer who has completed irrigation systems similar in material, design, and extent to that indicated for Project that have resulted in construction with a record of successful in-service performance.
- E. Listing/Approval Stamp, Label, or Other Marking: On equipment, specialties, and accessories made to specified standards.
- F. Listing and Labeling: Equipment, specialties, and accessories that are listed and labeled.
 - 1. The Terms "Listed" and "Labeled": As defined in "National Electrical Code," Article 100.
 - 2. Listing and Labeling Agency Qualifications: A "Nationally Recognized Testing Laboratory" (NRTL) as defined in OSHA Regulation 1910.7.

SECTION 32 84 00

PLANTING IRRIGATION

- G. Manufacturing Qualifications: Provide underground sprinkler system as a complete unit produced by Rain Bird for all portions of work, including heads, valves, piping circuits, controls, and accessories

1.7 PROJECT CONDITIONS

- A. The Contractor shall be responsible for verifying the exact location of all underground utilities prior to excavation.

1.8 SEQUENCING AND SCHEDULING

- A. Coordinate irrigation systems work with landscape work specified in Division 32.

1.9 EXTRA MATERIALS

- A. Deliver extra materials to Owner. Furnish extra materials matching products installed. Package them with protective covering for storage and label clearly describing contents.
 - 1. A minimum of two keys with swivel adapters will be given to the Owner.

PART 2 - PRODUCTS

2.1 PIPE AND TUBE FITTINGS

- A. PVC Pipe and Fitting:
Pipe specified shall be virgin high-impact Polyvinyl Chloride (PVC) pipe having a minimum working pressure rating of Class 200. All PVC pipe shall be continuously and permanently marked with manufacturer's name, material size, and schedule. Pipe shall conform to US Department of Commerce Commercial Standard CS207-60 or latest revision. Material shall conform to all requirements of Commercial Standard (CS256-63), or latest revision(s).

All fittings to be used on specified PVC pipe shall be Schedule 40 PVC, Type 1, and must be of domestic manufacture. All fittings shall be identified as to pressure rating or schedule.

Fittings for belled-spigot type pipe shall be of the same manufacture as the pipe and shall be either unplasticized PVC or asbestos-cement with brass inserts for tapped outlets. (Tapped coupling)

Risers and Swing Joint Nipples:

All pipe risers $\frac{3}{4}$ " to 1" shall be unplasticized polyvinyl chloride, Schedule 80 threaded pipe. Fittings on risers shall be PVC Schedule 80 threaded elbows.

2.2 JOINING MATERIALS

- A. Solvent for use on PVD pipe and fittings shall be of a type approved by the manufacturer of the pipe.

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- B. Primer shall be purple primer, model number C-60 as manufactured by Para-Bond, or approved equal.

2.3 CONTROL VALVES

- A. Irrigation Valves:
Irrigation valves shall be molded valves with 24 volt solenoid. Valves shall be globe type operated by low-voltage solenoids normally closed, manual flow adjustment.
- B. Control Valve Boxes: Polyethylene (PE), acrylonitrile-butadiene- styrene (ABS), fiberglass, polymer concrete, or precast concrete box and cover. Size as required for application.
 - 1. Drainage Backfill: Cleaned gravel or crushed stone, graded from 3 inches (75 mm) maximum to 3/4 inch (19 mm) minimum.

2.4 SPRINKLERS

- A. Description: Manufacturer's standard sprinklers designed to provide uniform coverage over entire area of spray at available water pressure, as follows:
 - 1. Flush, Surface: Fixed pattern, with screw-type flow adjustment.
 - 2. Shrubbery: Fixed pattern, with screw-type flow adjustment.
 - 3. Pop-Up, Spray: Fixed pattern, with screw-type flow adjustment and stainless-steel retraction spring.
 - 4. Pop-Up, Rotary Spray: Gear drive, full-circle and adjustable part-circle type.

2.5 AUTOMATIC CONTROL SYSTEM

- A. Description: Low-voltage controller system, made for control of irrigation system automatic control valves. Controller operates on 120 volts a.c. building power system, provides 24 volts a.c. power to control valves, and includes stations for the number of control valves indicated, plus two future stations.
- B. Exterior Control Enclosures: Manufacturer's standard weatherproof metal enclosure with locking cover and 2 matching keys. Enclosure construction complies with NFPA 70 and NEMA 250, Type 4, and includes provision for grounding.

PART 3 - EXECUTION

3.1 INSPECTION OF WORK IN PROGRESS

- A. The Landscape Architect shall make frequent observations of the Contractor's work while such work is in progress. The Landscape Architect shall bring to the attention of the Contractor any work which does not meet the specifications of the contract and the Contractor shall correct such work as brought to his attention.

3.2 STAKING OF SPRINKLER LOCATIONS

- A. Staking of sprinkler locations shall be done by the Contractor. Location shall be according to approved plans with field modifications to adjust to local conditions and actual plant locations.

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3.3 EXCAVATION

- A. The Contractor shall notify ULOCO @ 1-800-632-4949 or soft dig 48 hours prior to beginning trenching. The Contractor shall exercise reasonable care to avoid causing damage to any and all underground utilities and structures. The Landscape Architect shall advise the Contractor of any underground utilities or structures of which he is aware, however, it is the Contractor's responsibility to locate and to protect all utilities. Any damage to utilities shall be corrected and paid for by the Contractor.
- B. All excavation shall be unclassified and shall include all materials encountered except materials which cannot be excavated by normal mechanical excavation means. Such exceptions shall be brought to the attention of the Landscape Architect and an adjustment in price shall be agreed upon before excavation of these areas proceeds. Such price adjustments and agreement shall include responsibility for disposal of the unsuitable materials removed from the trench and the acquiring of additional backfill materials.
- C. The minimum depth of cover for piping 6" and larger shall be 18". The minimum depth of cover for piping less than 6" shall be 12".

Install piping free of sags and bends.

Locate groups of pipes paralld to each other, spaced to permit valve servicing.
- D. Trenching of existing asphalt shall be minimized. Contractor shall coordinate crossings of asphalt pavement with general contractor. 4" schd.40 PVC sleeving shall be installed at these locations under the pavement. If trenching is required, it shall be the responsibility of the contractor to sawcut the asphalt, excavate the trench and backfill with 57 stone and patch the asphalt back to original thickness and elevation.
- E. The contractor shall exercise reasonable care to avoid causing damage to any and all underground utilities and structures. The contractor shall have utilities located 48 hours prior to beginning trenching. The landscape architect shall advise the contractor of any underground utilities or structures of which he is aware. However, it is the contractor's responsibility to locate and protect all utilities. Any damage to utilities shall be corrected and paid for by the contractor.

3.4 BACKFILLING

- A. Backfill material shall be free from rocks, large stones, and other unsuitable substances which could damage the pipe or create unusual settling problems. Backfilling will be done in 6" layers and tamped after each layer is put in to prevent excessive settling.
- B. Backfilling of trenches containing plastic pipe shall be done when pipe is cool to avoid excessive contraction in cold weather. Such backfilling can be done in early morning hours or the pipe may be water cooled prior to backfilling procedures.

3.5 INSTALLATION OF SYSTEM MAIN

- A. Installation of the system main shall be in accordance with the manufacturer's instructions and shall proceed from the point of connection of supply for the system pumping station, reservoir,

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water meter, or existing line. Install 12" below finished grades or 6" below frost line, whichever is greater.

The main and laterals shall be flushed and pressure tested for 24 hours prior to making any head connection.

3.6 INSTALLATION OF LATERAL LINES

- A. Lateral lines may be installed by standard trenching techniques or by "pulling in" pipe. If the "pull in" method is used, the pipe "plow" shall be a vibratory type and equipped with a turf roller device to prevent tearing of the turf. The Mole or Bullet which precedes the pipe and is used to form the opening for the pipe, shall be not less that 1" larger in diameter than the outside diameter of the pipe. Starting and finishing holes shall not exceed a 2 foot square opening, with the sod removed from such holes to be preserved and replaced.
- B. Lateral pipes and fittings shall be installed in accordance with the manufacturer's recommendations, including the snaking-in of the PVC pipe to prevent excessive strain when contracting in cold weather.
- C. All lateral lines shall be thoroughly flushed prior to the installation of any automatic valves or sprinkler heads.

3.7 SPRINKLER HEADS

- A. All sprinklers shall be installed on pop-up risers or as shown on the drawings. The sprinkler head shall be installed so that the top is 1/4" above the finished grade level. If finished grade has not been established, the sprinkler will be extended a minimum of 4" above existing level and marked with a stake to prevent damage by equipment.
- B. Backfill around the swing joint and sprinkler shall be free of large rocks, roots, or foreign debris.

Matched precipitation will be required on all full and part circle sprinklers operating on the same zone.

- C. Mount stationary riser sprinklers on three schedule 80 PVC 90° elbows FPT x FPT to make up the three elbow swing joint.
- D. Mount pop-up sprinklers with an 18" minimum length up 1/2" polyethylene tubing. Tubing to withstand 400 psi burst test and shall have a wall thickness of 0.1". Fittings for tubing shall be compatible and made by the same manufacturers.

3.8 CONTROL LINES

- A. All control lines shall be installed in a neat and orderly fashion and may be installed either in the main and lateral trenching or in their own separate trench. The lines shall be bundled together and taped every 10'. Control line connections shall be as approved in a preceding section of these specifications.
- B. All wire shall be furnished in minimum 2,500' reels and spliced only at valve or tee locations
- C. The joining of all control lines will be by the use of wire nuts covered by Scotch Lok per installation instructions provided by manufacturer.

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- D. Control tubing and wire runs shall be installed with enough slack and/or occasional expansion loops to prevent excessive strain due to thermal contraction.

3.9 CONTROL EQUIPMENT

- A. All automatic valves and controllers shall be installed following the recommendations of the manufacturers of said equipment. The location of all controllers shall be approved by the Owner's representative before the actual installation of said controllers.

3.10 QUICK COUPLING VALVES

All quick coupling valves shall be mounted on galvanized pipe triple swing joints.

3.11 VALVE BOXES, DRAINS, ETC.

All valve boxes, or any other miscellaneous marker or access box shall be installed so the top of said structure is at finished grade.

3.12 TESTING AND ACCEPTANCE OF SYSTEM

- A. Testing System:
Upon completion of the irrigation system and after sufficient time has been allowed for solvent weld joints to cure, the entire system shall be tested for proper operation. All air will be flushed from the system and all components will be checked for proper operation by the Contractor.

Balancing and Adjustment: The Contractor shall balance and adjust the various components of the sprinkler system so the overall operation of the system is most efficient. This includes a synchronization of the controllers, adjustments to pressure regulators, pressure relief valves, part circle sprinkler heads, and individual station adjustments on the controllers.

- B. Operational Testing:
Perform operational testing after hydrostatic testing, backfill is in place, and sprinkler heads are adjusted to final position. Demonstrate to the Owner's representative that the completed system meets coverage requirements and that automatic controls function properly.

- C. Final Grades at Heads:
After completion of sodding, planting and mulching and settlement with establishment of the final grades, carefully adjust all irrigation equipment so it will be flush with or not more than 1/4" above grade.

- D. Notice of Completion:
When the Contractor is satisfied the system is operating properly, and all work and clean-up is completed, then he shall issue the notice of completion to the Landscape Architect. The notice of completion shall include the request for final inspection on which date and time given.

- E. Final Inspection with Landscape Architect:

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The Landscape Architect will respond to the notice of completion by the Contractor and shall appear at an agreed upon time for the final inspection. Any inconsistencies to the plans or specifications shall be noted by the Landscape Architect and a written copy of corrections shall be given to the Contractor.

- F. Record Plan Acceptance:
Acceptance of the system is based on the furnishing, by the Contractor, of a completed record plan which is acceptable to the Owner and/or the Landscape Architect.
- G. Training of Maintenance Personnel in Operation and Maintenance of System:
The Contractor's responsibility of training maintenance personnel in the operation and maintenance of the system, shall not be waived due to acceptance of the system. In addition, the Contractor shall provide the Owner with available parts list, trouble shooting list, and specification sheet. If this responsibility is not fulfilled, the cost of obtaining this training by the Owner shall be shown as a deduction in the final payment.

3.13 GUARANTEES

- A. The work included under this contract shall be guaranteed by the Contractor against all defects and malfunctions due to faulty workmanship or defective material for a period of one year from the date of final acceptance by the Owner. Upon being informed by the Owner of any defects or malfunctions, the Contractor shall effect all necessary repairs and/or replacements in a reasonable expedient manner at no additional cost to the Owner.
- B. Emergency repairs, when necessary may be made by the Owner without relieving the Contractor of his guarantee obligation.
- C. The Contractor shall be obligated to repair any settling of backfilled trenches which may occur during the guarantee period. The Contractor is also obligated to restore any and all damaged plantings, paving, or improvements due to trench settlement or repairs within the year period.
- D. If the Contractor does not respond to the Owner's request for repair work with a period of 5 days, the Owner may proceed with such necessary repairs and charge the Contractor for all expenses incurred in the repair work.

3.14 RECORD DRAWING

- A. The Contractor shall provide and keep up to date a complete set of record drawings which shall be corrected daily to show changes in sprinkler locations, controller locations, wire sizes and locations, piping locations, pipe sizes, and any deviations from the original irrigation design drawing as provided to him. All isolation valve locations, backflow prevention, water meters, and quick couplers shall be shown with actual measurements to reference points so they may be located easily in the field.
- B. Upon completion of the work, the Contractor shall furnish the Owner with a complete set of record drawings showing the irrigation system as installed.

END OF SECTION

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SECTION 32 9100
PLANTING SOIL

PART 1 – GENERAL

1.1 SUMMARY

- A. The scope of work includes all labor, materials, tools, supplies, equipment, facilities, transportation and services necessary for, and incidental to performing all operations in connection with furnishing, delivery, and installation of Planting Soil and /or the modification of existing site soil for use as Planting Soil, complete as shown on the drawings and as specified herein.
- B. The scope of work in this section includes, but is not limited to, the following:
 - 1. Locate, purchase, deliver and install Imported Planting Soil and soil amendments.
 - 2. Harvest and stockpile existing site soils suitable for Planting Soil.
 - 3. Modify existing stockpiled site soil.
 - a. Modify existing site soil in place for use as Planting Soil.
 - b. Install existing or modified existing soil for use as Planting Soil.
 - 4. Locate, purchase, deliver and install subsurface Drain Lines.
 - 5. Fine grade Planting Soil.
 - 6. Install Compost into Planting Soil.
 - 7. Clean up and disposal of all excess and surplus material.

1.2 CONTRACT DOCUMENTS

- A. Shall consist of specifications, general conditions, and the drawings. The intent of these documents is to include all labor, materials, and services necessary for the proper execution of the work. The documents are to be considered as one. Whatever is called for by any parts shall be as binding as if called for in all parts.

1.3 RELATED DOCUMENTS AND REFERENCES

- A. Related Documents:
 - 1. Drawings and general provisions of contract, including general and supplementary conditions and Division I specifications, apply to work of this section.
 - 2. Related Specification Section
 - a. Section - Planting
 - b. Section - Irrigation
 - c. Section – Lawn
 - d. Section – Tree and Plant Protection
- B. References: The following specifications and standards of the organizations and documents listed in this paragraph form a part of the Specification to the extent required by the references thereto. In the event that the requirements of the following referenced standards and specification conflict with this specification section the requirements of this specification shall prevail. In the event that the requirements of any of the following referenced standards and specifications conflict with each other the more stringent requirement shall prevail.
 - 1. ASTM: American Society of Testing Materials cited section numbers.
 - 2. U.S. Department of Agriculture, Natural Resources Conservation Service, 2003. National Soil Survey Handbook, title 430-VI. Available Online.
 - 3. US Composting Council www.compostingcouncil.org and http://compostingcouncil.org/admin/wp-content/plugins/wp-pdfupload/pdf/191/LandscapeArch_Specs.pdf.

4. *Methods of Soil Analysis*, as published by the Soil Science Society of America (<http://www.soils.org/>).
5. *Up by Roots: healthy soils and trees in the built environment*. 2008. J. Urban. International Society of Arboriculture, Champaign, IL.

1.4 VERIFICATION

- A. All scaled dimensions on the drawings are approximate. Before proceeding with any work, the Contractor shall carefully check and verify all dimensions and quantities and shall immediately inform the Owner's Representative of any discrepancies between the information on the drawings and the actual conditions, refraining from doing any work in said areas until given approval to do so by the Owner's Representative.

1.5 PERMITS AND REGULATIONS

- A. The Contractor shall obtain and pay for all permits related to this section of the work unless previously excluded under provision of the contract or general conditions. The Contractor shall comply with all laws and ordinances bearing on the operation or conduct of the work as drawn and specified. If the Contractor observes that a conflict exists between permit requirements and the work outlined in the contract documents, the Contractor shall promptly notify the Owner's Representative in writing including a description of any necessary changes and changes to the contract price resulting from changes in the work.
- B. Wherever references are made to standards or codes in accordance with which work is to be performed or tested, the edition or revision of the standards and codes current on the effective date of this contract shall apply, unless otherwise expressly set forth.
- C. In case of conflict among any referenced standards or codes or among any referenced standards and codes and the specifications, the more restrictive standard shall apply or Owner's Representative shall determine which shall govern.

1.6 PROTECTION OF WORK, PROPERTY AND PERSON

- A. The Contractor shall adequately protect the work, adjacent property, and the public, and shall be responsible for any damages or injury due to the Contractor's actions.

1.7 CHANGES IN WORK

- A. The Owner's Representative may order changes in the work, and the contract sum adjusted accordingly. All such orders and adjustments plus claims by the Contractor for extra compensation must be made and approved in writing before executing the work involved.
- B. All changes in the work, notifications and contractor's request for information (RFI) shall conform to the contract general condition requirements.

1.8 CORRECTION OF WORK

- A. The Contractor shall re-execute any work that fails to conform to the requirements of the contract and shall remedy defects due to faulty materials or workmanship upon written notice from the Owner's Representative, at the soonest possible time that can be coordinated with other work and seasonal weather demands but not more than 180 (one hundred and eighty) days after notification.

1.9 DEFINITIONS

- A. **Acceptable drainage:** Drainage rate is sufficient for the plants to be grown. Not too fast and not too slow. Typical rates for installed Planting Soil are between 1 - 5 inches per hour. Turf soils are often higher, but drainage rates above 2 - 3 inches per hour will dry out very fast. In natural undisturbed soil a much lower drainage rate, as low as 1/8th inch per hour can still support good plant growth. Wetland plants can grow on top of perched water layers or even within seasonal perched water layers but could become unstable in high wind events.
- B. **Amendment:** material added to Topsoil to produce Planting Soil Mix. Amendments are classified as general soil amendments, fertilizers, biological, and pH amendments.

- C. Biological Amendment: Amendments such as Mycorrhizal additives, compost tea or other products intended to change the soil biology.
- D. Compacted soil: soil where the density of the soil is greater than the threshold for root limiting, and further defined in this specification.
- E. Compost: well decomposed stable organic material as defined by the US Composting Council and further defined in this specification.
- F. Drainage: The rate at which soil water moves through the soil transitioning the soil from saturated condition to field capacity. Most often expressed as saturated hydraulic conductivity (Ksat; units are inches per hour).
- G. End of Warranty Acceptance: The date when the Owner's Representative accepts that the plants and work in this section meet all the requirements of the warranty. It is intended that the materials and workmanship warranty for Planting, Planting Soil, and Irrigation (if applicable) work run concurrent with each other, and further defined in this specification.
- H. Existing Soil: Mineral soil existing at the locations of proposed planting after the majority of the construction within and around the planting site is completed and just prior to the start of work to prepare the planting area for soil modification and/or planting, and further defined in this specification.
- I. Fertilizer: amendment used for the purpose of adjusting soil nutrient composition and balance.
- J. Fine grading: The final grading of the soil to achieve exact contours and positive drainage, often accomplished by hand rakes or drag rakes or other suitable devices, and further defined in this specification, and further defined in this specification.
- K. Finished grade: surface or elevation of Planting Soil after final grading and 12 months of settlement of the soil, and further defined in this specification.
- L. Graded soil: Soil where the A horizon has been stripped and relocated or re-spread; cuts and fills deeper than 12 inches, and further defined in this specification.
- M. Installed soil: Planting soil and existing site soil that is spread and or graded to form a planting soil, and further defined in this specification.
- N. Minor disturbance: Minor grading as part of agricultural work that only adjusts the A horizon soil, minor surface compaction in the top 6 inches of the soil, applications of fertilizers, installation of utility pipes smaller than 18 inches in diameter thru the soil zone.
- O. Owner's Representative: The person or entity, appointed by the Owner to represent their interest in the review and approval of the work and to serve as the contracting authority with the Contractor. The Owner's Representative may appoint other persons to review and approve any aspects of the work.
- P. Ped: a clump or clod of soil held together by a combination of clay, organic matter, and fungal hyphae, retaining the original structure of the harvested soil.
- Q. Planting Soil: Topsoil, or Planting Soil Mixes which are imported or existing at the site, or made from components that exist at the site, or are imported to the site; and further defined in this specification.
- R. *Poor drainage: Soil drainage that is slower than that to which the plants can adapt. This is a wide range of metrics, but generally if the soil is turning grey in color it is reasonable preferable to either to plant moisture adaptive plants at smaller sizes that are young in age with shallow root balls or look at options to improve the drainage*
- S. Scarify: Loosening and roughening the surface of soil and sub soil prior to adding additional soil on top, and further defined in this specification.
- T. Soil Fracturing: Deep loosening the soil to the depths specified by using a back hoe, and further defined in this specification.
- U. Soil Horizons: as defined in the USDA National Soil Survey Handbook
http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/scientists/?cid=nrcs142p2_054242.

- V. Soil Ripping: Loosening the soil by dragging a ripping shank or chisel thru the soil to the depths and spacing specified, and further defined in this specification.
- W. Soil Tilling: Loosening the surface of the soil to the depths specified with a rotary tine tilling machine, roto tiller, (or spade tiller), and further defined in this specification.**
- X. Soil trenching: Cutting narrow trenches thru the soil at the depths and spacing specified to loosen the soil profile, and further defined in this specification.
- Y. Subgrade: surface or elevation of subsoil remaining after completing excavation, or top surface of a fill or backfill, before placing Planting Soil.
- Z. Substantial Completion Acceptance: The date at the end of the Planting, Planting Soil, and Irrigation installation (if applicable) where the Owner's Representative accepts that all work in these sections is complete and the Warranty period has begun. This date may be different than the date of substantial completion for the other sections of the project, and further defined in this specification.
- AA. Topsoil: naturally produced and harvested soil from the A horizon or upper layers or the soil as further defined in this specification.
- BB. Undisturbed soil: Soils with the original A horizon intact that have not been graded or compacted. Soils that have been farmed, subjected to fire or logged but not graded, and natural forested land will be considered as undisturbed.

1.10 SUBMITTALS

- A. See the contract General Conditions for policy and procedures related to submittals.
- B. Submit all product submittals eight weeks prior to the start of the soil work.
- C. Product data and certificates: For each type of manufactured product, submit data and certificates that the product meets the specification requirements, signed by the product manufacturer, and complying with the following:
 - 1. Submit manufacturers or supplier's product data and literature certified analysis for standard products and bulk materials, complying with testing requirements and referenced standards and specific requested testing.
 - a. For each Compost product submit the following analysis by a recognized laboratory:
 - 1.) pH
 - 2.) Salt concentration (electrical conductivity)
 - 3.) Moisture content %, wet weight basis
 - 4.) Particle size % passing a selected mesh size, dry weight basis
 - 5.) Stability carbon dioxide evolution rate mg CO₂-C per g OM per day
 - 6.) Solvita maturity test
 - 7.) Physical contaminants (inerts) %, dry weight basis
 - 8.) US EPA Class A standard, 40CFR § 503.13, Tables 1 and 3 levels Chemical Contaminants mg/kg (ppm)
 - b. For Coarse Sand product submit the following analysis by a recognized laboratory:
 - 1.) pH
 - 2.) Particle size distribution (percent passing the following sieve sizes):
 - 3/8 inch (9.5 mm)
 - No 4 (4.75 mm)
 - No 8 (2.36 mm)
 - No 16 (1.18 mm)
 - No 30 (.60 mm)
 - No 50 (.30 mm)
 - No 100 (.15 mm)
 - No 200 (.075 mm)
- D. Samples: Submit samples of each product and material, where required by Part 2 of the specification,

to the Owner's Representative for approval. Label samples to indicate product, characteristics, and locations in the work. Samples will be reviewed for appearance only.

1. Submit samples a minimum of 8 weeks prior to the anticipated date of the start of soil installation.
 2. Samples of all Topsoil, Coarse Sand, Compost and Planting Soil shall be submitted at the same time as the particle size and physical analysis of that material.
- E. Soil testing for Imported and Existing Topsoil, existing site soil to be modified as Planting Soil and Planting Soil Mixes.
1. Topsoil, existing site soil and Planting Soil Mix testing: Submit soil test analysis report for each sample of Topsoil, existing site soil and Planting Soil from an approved soil-testing laboratory and where indicated in Part 2 of the specification as follows:
 - a. Submit Topsoil, Planting Soil, Compost, and Coarse Sand for testing at least 8 weeks before scheduled installation of Planting Soil Mixes. Submit Planting Soil Mix test no more than 2 weeks after the approval of the Topsoil, Compost and Coarse Sand. Do not submit to the testing laboratory, Planting Soil Mixes, for testing until all Topsoil, Compost and Coarse Sand have been approved.
 - b. If tests fail to meet the specifications, obtain other sources of material, retest and resubmit until accepted by the Owner's Representative.
 - c. All soil testing will be at the expense of the Contractor.
 2. Provide a particle size analysis (% dry weight) and USDA soil texture analysis. Soil testing of Planting Soil Mixes shall also include USDA gradation (percentage) of gravel, coarse sand, medium sand, and fine sand in addition to silt and clay.
 3. Provide the following other soil properties:
 - a. pH and buffer pH.
 - b. Percent organic content by oven dried weight.
 - c. Nutrient levels by parts per million including: phosphorus, potassium, magnesium, manganese, iron, zinc and calcium. Nutrient test shall include the testing laboratory recommendations for supplemental additions to the soil for optimum growth of the plantings specified.
 - d. Soluble salt by electrical conductivity of a 1:2 soil water sample measured in Milliohm per cm.
 - e. Cation Exchange Capacity (CEC).

1.11 OBSERVATION OF THE WORK

- A. The Owner's Representative may observe the work at any time. They may remove samples of materials for conformity to specifications. Rejected materials shall be immediately removed from the site and replaced at the Contractor's expense. The cost of testing materials not meeting specifications shall be paid by the Contractor.
1. The Owner's Representative may utilize the Contractor's penetrometer and moisture meter at any time to check soil compaction and moisture.
- B. The Owner's Representative shall be informed of the progress of the work so the work may be observed at the following key times in the construction process. The Owner's Representative shall be afforded sufficient time to schedule visit to the site. Failure of the Owner's Representative to make field observations shall not relieve the Contractor from meeting all the requirements of this specification.
1. EXISTING SOIL CONDITIONS REVIEW: Prior to the start of any soil modification that will utilize or modify the existing soil.
 2. EXCAVATION REVIEW: Observe each area of excavation prior to the installation of any Planting Soil.
 3. DRAIN LINE INSTALLATION REVIEW: Upon completion of the installation of drain lines and prior to the installation of any Planting Soil

4. COMPLETION of SOIL MODIFICATIONS REVIEW: Upon completion of all soil modification and installation of planting soil.
5. COMPLETION OF FINE GRADING AND SURFACE SOIL MODIFICATIONS REVIEW: Upon completion of all surface soil modifications and fine grading but prior to the installation of shrubs, ground covers, or lawns.

1.12 PRE-CONSTRUCTION CONFERENCE

- A. Schedule a pre-construction meeting with the Owner's Representative at least seven (7) days before beginning work to review any questions the Contractor may have regarding the work, administrative procedures during construction and project work schedule.

1.13 QUALITY ASSURANCE

- A. Installer Qualifications: The installer shall be a firm having at least 5 years of experience of a scope similar to that required for the work, including the preparation, mixing and installation of soil mixes to support planting. The installer of the work in Section: Planting, shall be the same firm installing the work in this section.
 1. The bidders list for work under this section shall be approved by the Owner's Representative.
 2. Installer Field Supervision: When any Planting Soil work is in progress, installer shall maintain, on site, an experienced full-time supervisor who can communicate in English with the Owner's Representative.
 3. Installer's field supervisor shall have a minimum of three years experience as a field supervisor installing soil, shall be trained and proficient in the use of field surveying equipment to establish grades and can communicate in English with the Owner's Representative.
 4. The installer's crew shall be experienced in the installation of Planting Soil, plantings, and irrigation (where applicable) and interpretation of planting plans, soil installation plans, and irrigation plans (where applicable).
 5. Submit references of past projects and employee training certifications that support that the Contractors meet all of the above installer qualifications and applicable licensures.
- B. Soil testing laboratory qualifications: an independent laboratory, with the experience and capability to conduct the testing indicated and that specializes in USDA agricultural soil testing, Planting Soil Mixes, and the types of tests to be performed. Geotechnical engineering testing labs shall not be used.
- C. All delivered and installed Planting Soil shall conform to the approved submittals sample color, texture and approved test analysis.
 1. The Owner's Representative may request samples of the delivered or installed soil be tested for analysis to confirm the Planting Soil conforms to the approved material.
 2. All testing shall be performed by the same soil lab that performed the original Planting Soil testing.
 3. Testing results shall be within 10% plus or minus of the values measured in the approved Planting Soil Mixes.
 4. Any Planting Soil that fails to meet the above criteria, if requested by the Owner's Representative, shall be removed and new soil installed.
- D. Soil compaction testing: following installation or modification of soil, test soil compaction with a penetrometer.
 1. Maintain at the site at all times a soil cone penetrometer with pressure dial and a soil moisture meter to check soil compaction and soil moisture.
 - a. Penetrometer shall be AgraTronix Soil Compaction Meter distributed by Ben Meadows, www.benmeadows.com or approved equal.

- b. Moisture meter shall be “general digital soil moisture meter” distributed by BenMeadows, www.benmeadows.com or approved equal.
2. Prior to testing the soil with the penetrometer check the soil moisture and penetrometer readings in the mockup soils. Penetrometer readings are impacted by soil moisture and excessively wet or dry soils will read significantly lower or higher than soils at optimum moisture.
3. The penetrometer readings shall be within 20% plus or minus of the readings in the approved mockup when at similar moisture levels.

1.14 SITE CONDITIONS

- A. It is the responsibility of the Contractor to be aware of all surface and subsurface conditions, and to notify the Owner’s Representative, in writing, of any circumstances that would negatively impact the health of plantings. Do not proceed with work until unsatisfactory conditions have been corrected.
 1. Should subsurface drainage or soil conditions be encountered which would be detrimental to growth or survival of plant material, the Contractor shall notify the Owner’s Representative in writing, stating the conditions and submit a proposal covering cost of corrections. If the Contractor fails to notify the Owner’s Representative of such conditions, they shall remain responsible for plant material under the warrantee clause of the specifications.
 2. This specification requires that all Planting Soil and Irrigation (if applicable) work be completed and accepted prior to the installation of any plants.

1.15 SOIL COMPACTION – GENERAL REQUIREMENTS

- A. Except where more stringent requirements are defined in this specification. The following parameters shall define the general description of the threshold points of soil compaction in existing, modified or installed soil and subsoil.
- B. The following are threshold levels of compaction as determined by each method.
 1. Acceptable Compaction: Good rooting anticipated, but increasing settlement expected as compaction is reduced and/or in soil with a high organic matter content.
 - a. Penetration Resistance Method – about 75-250 psi, below 75 psi soil becomes increasingly unstable and will settle excessively.
 2. Root limiting Compaction: Root growth is limited with fewer, shorter and slower growing roots.
 - a. Penetration Resistance Method – about 300 psi.
 3. Excessive Compaction: Roots not likely to grow but can penetrate soil when soil is above field capacity.
 - a. Penetration Resistance Method – Approximately above 400 psi

1.16 DELIVERY, STORAGE, AND HANDLING

- A. Weather: Do not mix, deliver, place or grade soils when frozen or with moisture above field capacity.
- B. Protect soil and soil stockpiles, including the stockpiles at the soil blender’s yard, from wind, rain and washing that can erode soil or separate fines and coarse material, and contamination by chemicals, dust and debris that may be detrimental to plants or soil drainage. Cover stockpiles with plastic sheeting or fabric at the end of each workday.
- C. All manufactured packaged products and material shall be delivered to the site in unopened containers and stored in a dry enclosed space suitable for the material and meeting all environmental regulations. Biological additives shall be protected from extreme cold and heat. All products shall be freshly manufactured and dated for the year in which the products are to be used.
- D. Deliver all chemical amendments in original, unopened containers with original labels intact and legible, which state the guaranteed chemical analysis. Store all chemicals in a weatherprotected enclosure.
- E. Bulk material: Coordinate delivery and storage with Owner’s Representative and confine materials to

neat piles in areas acceptable to Owner's Representative.

1.17 EXCAVATING AND GRADING AROUND UTILITIES

- A. Contractor shall carefully examine the civil, record, and survey drawings to become familiar with the existing underground conditions before digging.
- B. Determine location of underground utilities and perform work in a manner that will avoid damage. Hand excavate as required. Maintain grade stakes set by others until parties concerned mutually agree upon removal.
- C. Notification of the *local utility locator service, Insert PHONE NUMBER*, is required for all planting areas. The Contractor is responsible for knowing the location and avoiding utilities that are not covered by the *local utility locator service*.

PART 2 – PRODUCTS

2.1 IMPORTED TOPSOIL

- A. Imported Topsoil definition: Fertile, friable soil containing less than 5% total volume of the combination of subsoil, refuse, roots larger than 1 inch diameter, heavy, sticky or stiff clay, stones larger than 2 inches in diameter, noxious seeds, sticks, brush, litter, or any substances deleterious to plant growth. The percent (%) of the above objects shall be controlled by source selection not by screening the soil. Topsoil shall be suitable for the germination of seeds and the support of vegetative growth. Imported Topsoil shall not contain weed seeds in quantities that cause noticeable weed infestations in the final planting beds. Imported Topsoil shall meet the following physical and chemical criteria:
 - 1. Soil texture: USDA loam, sandy clay loam or sandy loam with clay content between 15 and 25%. And a combined clay/silt content of no more than 55%.
 - 2. pH value shall be between 5.5 and 7.0.
 - 3. Percent organic matter (OM): 2.0-5.0%, by dry weight.
 - 4. Soluble salt level: Less than 2 mmho/cm.
 - 5. Soil chemistry suitable for growing the plants specified.
- B. Imported Topsoil shall be a harvested soil from fields or development sites. The organic content and particle size distribution shall be the result of natural soil formation. Manufactured soils where Coarse Sand, Composted organic material or chemical additives has been added to the soil to meet the requirements of this specification section shall not be acceptable. Retained soil peds shall be the same color on the inside as is visible on the outside.
- C. Imported Topsoil for Planting Soil shall NOT have been screened and shall retain soil peds or clods larger than 2 inches in diameter throughout the stockpile after harvesting.
- D. Stockpiled Existing Topsoil at the site meeting the above criteria may be acceptable.
- E. Provide a two gallon sample from each Imported Topsoil source with required soil testing results. The sample shall be a mixture of the random samples taken around the source stockpile or field. The soil sample shall be delivered with soil peds intact that represent the size and quantity of expected peds in the final delivered soil.

2.2 COMPOST

- A. Compost: Blended and ground leaf, wood and other plant based material, composted for a minimum of 9 months and at temperatures sufficient to break down all woody fibers, seeds and leaf structures, free of toxic material at levels that are harmful to plants or humans. Source material shall be yard waste trimmings blended with other plant or manure based material designed to produce Compost high in fungal material.
 - 1. Compost shall comply with the following parameters:
 - a. pH: 5.5 -8.0.

- a. Soil salt (electrical conductivity): maximum 5 dS/m (mmhos/cm).
 - b. Moisture content %, wet weight basis: 30 – 60.
 - c. Particle size, dry weight basis: 98% pass through 3/4 inch screen or smear.
 - d. Stability carbon dioxide evolution rate: mg CO₂-C/ g OM/ day < 2.
 - e. Solvita maturity test: > 6.
 - f. Physical contaminants (inerts), %, dry weight basis: <1%.
 - g. Chemical contaminants, mg/kg (ppm): meet or exceed US EPA Class A standard, 40CFR § 503.13, Tables 1 and 3 levels.
 - h. Biological contaminants select pathogens fecal coliform bacteria, or salmonella, meet or exceed US EPA Class A standard, 40 CFR § 503.32(a) level requirements.
- B. Provide a two gallon sample with manufacturer’s literature and material certification that the product meets the requirements.

2.3 COARSE SAND

- A. Clean, washed, sand, free of toxic materials
1. Coarse concrete sand, ASTM C-33 Fine Aggregate, with a Fines Modulus Index of 2.8 and 3.2.
 2. Coarse Sands shall be clean, sharp, natural Coarse Sands free of limestone, shale and slate particles. Manufactured Coarse Sand shall not be permitted.
 3. pH shall be lower than 7.0.
 4. Provide Coarse Sand with the following particle size distribution:

Sieve	Percent passing
3/8 inch (9.5 mm)	100
No 4 (4.75 mm)	95-100
No 8 (2.36 mm)	80-100
No 16 (1.18 mm)	50-85
No 30 (.60 mm)	25-60
No 50 (.30 mm)	10-30
No 100 (.15 mm)	2-10
No 200 (0.75 mm)	2-5
- B. Provide a two gallon sample with manufacturer’s literature and material certification that the product meets the requirements.

2.4 LIME

- A. ASTM C 602, agricultural limestone containing a minimum 80 percent calcium carbonate equivalent and as follows:
1. Class: Class T, with a minimum 99 percent passing through No. 8 (2.36-mm) sieve and a minimum 75 percent passing through No. 60 (0.25-mm) sieve.
 2. Provide lime in form of dolomitic limestone.
- B. Provide manufacturer’s literature and material certification that the product meets the requirements.

2.5 EXISTING SOIL (Acceptable for planting with minimum modifications)

- A. General definition of existing soil: Surface soil in the areas designated on the soils plan as existing soil, that is not altered, compacted to root limiting density, graded or contaminated before or during the construction process and considered acceptable for planting and long term health of the plants specified either as it exists or with only minor modification.
1. The Owner’s Representative shall verify that the soil in the designated areas is suitable at the beginning of planting bed preparation work in that area. In the event that the work of this project construction has damaged the existing soil in areas designated for use as Planting Soil to the point where the soil is no longer suitable to support the plants specified, the Owner’s

Representative may require modification of the damaged soil up to and including removal and replacement with soil of equal quality to the soil that existed prior to construction. Examples of damage include further compaction, contamination, grading, creation of hard pan or drainage problems, and loss of the O, and or A horizon.

- a. Do not begin work on additional modifications until changes to the contract price are approved by Owner's Representative.
- B. Protect existing soil from compaction, contamination, and degradation during the construction process.
- C. Unless otherwise instructed, remove all existing plants, root thatch, and non-soil debris from the surface of the soil using equipment that does not increase compaction of soil to root limiting levels.
- D. Modifications:
 1. When results of soil tests recommend chemical adjustments, till surface soil to six inches or greater after chemical adjustments have been applied.
 2. Remove existing turf thatch, ground cover plants and weeds.
 3. Provide pre-emergent weed control if indicated.
 4. Make chemical adjustment as recommended by the soil test.

2.6 MODIFIED EXISTING SOIL (SOIL SUITABLE FOR PLANTING WITH INDICATED MODIFICATION)

- A. General definition: Surface soil in the areas designated on the soils plan as Modified Existing Soil has been altered and or graded before or during the construction process but is still considered acceptable for planting and long term health of the plants specified with the proposed modifications. Modifications respond to the soil problems expected or encountered. The Owner's Representative shall verify that the soil in the designated areas is suitable for modification at the beginning of planting bed preparation work in that area.
 1. The Owner's Representative shall verify that the soil in the designated areas is suitable for the specified modification at the beginning of planting bed preparation work in that area. In the event that the work of this project construction has damaged the existing soil in areas designated for modification to the point where the soil is no longer suitable to support the plants specified with the specified modification, the Owner's Representative may require further modification of the damaged soil up to an including removal and replacement with soil of equal quality to the soil that would have resulted from the modification. Damage may include further compaction, contamination, grading, creation of hard pan or drainage problem, and loss of the O, and or A horizon.
 2. General requirements for all soil modifications:
 - a. Take soil samples, test for chemical properties, and make appropriate adjustments.
 - b. Unless otherwise instructed, remove all existing plants, root thatch, and non-soil debris from the surface of the soil using equipment that does not add to the compaction in the soil.
 - c. All soil grading, tilling and loosening must be completed at times when the soil moisture is below field capacity. Allow soil to drain for at least two days after any rain event more than 1 inch in 24 hours, or long enough so that the soil does not make the hand muddy when squeezed.
 - d. Provide pre-emergent weed control after the soil work is complete and plants planted but prior to adding mulch to the surface, if indicated by weed type and degree of threat.
- B. Modified existing soil – soil removed, stockpiled, and spread
 1. Description of condition to be modified: Existing soil that is suitable for reuse as Planting Soil but is in the wrong place of elevation or cannot be adequately protected during construction. Soil is to be harvested, stockpiled and re-spread with or without further modifications as indicated.
 2. Modifications:

- a. Excavate existing soil from the areas and to depths designated on the drawings. Stockpile in zones noted on the drawings or in areas proposed by the Contractor.
 - 1.) Prepare a soil stock pile plan for approval.
 - b. Excavate soil using equipment and methods to preserve the clumps and peds in the soil. Generally this means using the largest piece of equipment that is practical for the projectsize and scope.
 - c. Protect stock piles from erosion by compacting or tracking the soil surface, covering with breathable fabric or planting with annual grasses as appropriate for the season, location, and length of expected time of storage.
 - d. Re-spread soil as required in Part 3 of this specification.
- C. Modified existing soil – compacted surface soil (Tilling Option)
1. Description of condition to be modified: Surface soil compaction to a maximum of 6 inches deep from traffic or light grading. Original A horizon may be previously removed or graded but lower profile intact with acceptable compaction levels and limited grading. The soil organic matter, pH and chemistry in the A horizon may not be suitable for the proposed plants and may need to be modified as required.
 2. Modifications:
 - a. Till top 6 inches or deeper of the soil surface, with a *roto tiller*, *spade tiller*, ripper or agricultural plow. Spread 2 - 3 inches of Compost on the surface of the tilled soil and make any chemical adjustment as recommended by the soil test.
 - b. Till or disk the Compost into the loosened soil. Smooth out grades with a drag rake or drag slip.
- D. Modified existing soil – compacted subsoil
1. Description of condition to be modified: Deep soil compaction the result of previous grading, filling and dynamic or static compaction forces. Original A horizon likely removed or buried. The soil organic matter, pH and chemistry in the A horizon is likely not suitable for the proposed plants and should be modified as required.
 2. Soil Fracturing:
 - a. Step one: After grading and removing all plants and debris from the surface, spread 2 – 3 inches of Compost over the surface of the soil. Loosen the soil to depth of 18 - 24 inches, using a backhoe to dig into the soil through the Compost. Lift and then drop the loosened soil immediately back into the hole. The bucket then moves to the adjacent soil and repeats the process until the entire area indicated has been loosened.
 - b. Step 2: Spread 3-4 inches of Compost over the ripped area and till into the top 6 inches of the soil surface.
 3. Following soil ripping or fracturing the average penetration resistance should be less than 250 psi to the depth of the ripping or fracturing.
 4. Do not start planting into ripped or fractured soil until soil has been settled or leave grades sufficiently high to anticipate settlement of 10 – 15% of ripped soil depth.
- E. Modified existing soil – low organic matter
1. Description of condition to be modified: Low soil organic matter and/or missing A horizon but soil is not compacted except for some minor surface compaction. The soil organic matter, pH and/or chemistry are likely not suitable for the proposed plants and should be modified as required.
 2. Modifications:
 - a. Spread 3 - 4 inches of Compost over the surface of the soil and make chemical adjustment as recommended by the soil test.
 - b. Till Compost into the top 6 inches of the soil.
- F. Modified existing soil – soil within the root zone of existing established trees

1. Description of condition to be modified: Surface compaction near or above root limited levels in the upper soil horizon the result of traffic or other mechanical compaction.
2. Modifications:
 - a. Remove the tops of all plants to be removed from the root zone. Remove sod with a walk behind sod cutter. Do not grub out the roots of plants to be removed.
 - b. Use a pneumatic air knife to loosen the top 9 – 12 inches of the soil. Surface roots may move and separate from soil during this process but the bark on roots should not be broken
 - 1.) Pneumatic air knife shall be as manufactured by:
Concept Engineering Group, Inc., Verona, PA (412) 826-8800
or
Supersonic Air Knife, Inc., Allison Park, PA (866) 328 5723
 - c. Make chemical adjustment as recommended by the soil test and add 2 - 3 inches of Compost over the soil.
 - d. Using the pneumatic air knife, mix the Compost into the top 6 – 8 inches of the loosened soil.
 - e. Work in sections such that the entire process - including irrigation - can be completed in one day. Apply approximately one inch of water over the loosened soil at the completion of each day's work. Apply mulch or turf as indicated on the drawings within one week of the completion of work.

2.7 PLANTING SOIL MIXES

- A. General definition: Mixes of Existing Soil or Imported Topsoil, Coarse Sand, and or Compost to make a new soil that meets the project goals for the indicated planting area. These may be mixed off site or onsite, and will vary in Mix components and proportions as indicated.
- B. Planting Mix - moderately slow draining soil for trees and shrub beds
 1. A Mix of Imported Topsoil, Coarse Sand and Compost. The approximate Mix ratio shall be:

<u>Mix component % by moist volume</u>	
Imported Topsoil unscreened	45-50%
Coarse sand	40-45%
Compost	10%
 2. Final tested organic matter between 2.75 and 4% (by dry weight).
 3. Mix the Coarse Sand and Compost together first and then add to the Topsoil. Mix with a loader bucket to loosely incorporate the Topsoil into the Coarse Sand/Compost Mix. DO NOT OVER MIX! Do not mix with a soil blending machine. Do not screen the soil. Clumps of Soil, Compost and Coarse Sand will be permitted in the overall Mix.
 4. At the time of final grading, add fertilizer if required to the Planting Soil at rates recommended by the testing results for the plants to be grown.
 5. Provide a two gallon sample with testing data that includes recommendations for chemical additives for the types of plants to be grown. Samples and testing data shall be submitted at the same time.

2.8 PRE-EMERGENT HERBICIDES

- A. Chemical herbicides are designed to prevent seeds of selective plants from germinating. Exact type of herbicide shall be based on the specific plants to be controlled and the most effective date of application.
- B. Submit report of expected weed problems and the recommendation of the most effective control for approval by Owner's Representative. Provide manufacturer's literature and material certification that the product meets the requirements.

PART 3 – EXECUTION

3.1 SITE EXAMINATION

- A. Prior to installation of Planting Soil, examine site to confirm that existing conditions are satisfactory for the work of this section to proceed.
 - 1. Confirm that the subgrade is at the proper elevation and compacted as required. Subgrade elevations shall slope toward the under drain lines as shown on the drawings.
 - 2. Confirm that surface all areas to be filled with Planting Soil are free of construction debris, refuse, compressible or biodegradable materials, stones greater than 2 inches diameter, soil crusting films of silt or clay that reduces or stops drainage from the Planting Soil into the subsoil; and/or standing water. Remove unsuitable material from the site.
 - 3. Confirm that no adverse drainage conditions are present.
 - 4. Confirm that no conditions are present which are detrimental to plant growth.
 - 5. Confirm that utility work has been completed per the drawings.
 - 6. Confirm that irrigation work, which is shown to be installed below prepared soil levels, has been completed.
- B. If unsatisfactory conditions are encountered, notify the Owner's Representative immediately to determine corrective action before proceeding.

3.2 COORDINATION WITH PROJECT WORK

- A. The Contractor shall coordinate with all other work that may impact the completion of the work.
- B. Prior to the start of work, prepare a detailed schedule of the work for coordination with other trades.
- C. Coordinate the relocation of any irrigation lines, heads or the conduits of other utility lines that are in conflict with tree locations. Root balls shall not be altered to fit around lines. Notify the Owner's Representative of any conflicts encountered.

3.3 GRADE AND ELEVATION CONTROL

- A. Provide grade and elevation control during installation of Planting Soil. Utilize grade stakes, surveying equipment, and other means and methods to assure that grades and contours conform to the grades indicated on the plans.

3.4 SITE PREPARATION

- A. Excavate to the proposed subgrade. Maintain all required angles of repose of the adjacent materials as shown on the drawings or as required by this specification. Do not over excavate compacted subgrades of adjacent pavement or structures. Maintain a supporting 1:1 side slope of compacted subgrade material along the edges of all paving and structures where the bottom of the paving or structure is above the bottom elevation of the excavated planting area.
- B. Remove all construction debris and material including any construction materials from the subgrade.
- C. Confirm that the subgrade is at the proper elevation and compacted as required. Subgrade elevations shall slope approximately parallel to the finished grade and/or toward the subsurface drain lines as shown on the drawings.
- D. In areas where Planting Soil is to be spread, confirm subgrade has been scarified.
- E. Protect adjacent walls, walks and utilities from damage or staining by the soil. Use 1/2 inch plywood and or plastic sheeting as directed to cover existing concrete, metal and masonry work and other items as directed during the progress of the work.
 - 1. At the end of each working day, clean up any soil or dirt spilled on any paved surface.
 - 2. Any damage to the paving or site features or work shall be repaired at the Contractor's expense.

3.5 EXISTING SOIL MODIFICATION

- A. Follow the requirements for modifying existing soil as indicated by the construction drawings.

3.6 PLANTING SOIL AND PLANTING SOIL MIX INSTALLATION

- A. Prior to installing any Planting Soil from stockpiles or Planting Soil Mixes blended off site, the Owner's Representative shall approve the condition of the subgrade and the previously installed subgrade preparation and the installation of subsurface drainage.
- B. All equipment utilized to install or grade Planting Soils shall be wide track or balloon tire machines rated with a ground pressure of 4 psi or less. All grading and soil delivery equipment shall have buckets equipped with 6 inch long teeth to scarify any soil that becomes compacted.
- C. In areas of soil installation above existing subsoil, scarify the subgrade material prior to installing Planting Soil.
 - 1. Scarify the subsoil of the subgrade to a depth of 3 – 6 inches with the teeth of the back hoe or loader bucket, tiller or other suitable device.
 - 2. Immediately install the Planting Soil. Protect the loosened area from traffic. DO NOT allow the loosened subgrade to become compacted.
 - 3. In the event that the loosened area becomes overly compacted, loosen the area again prior to installing the Planting Soil.
- D. Install the Planting Soil in 12 - 18 inch lifts to the required depths. Apply compacting forces to each lift as required to attain the required compaction. Scarify the top of each lift prior to adding more Planting Soil by dragging the teeth of a loader bucket or backhoe across the soil surface to roughen the surface.
- E. Phase work such that equipment to deliver or grade soil does not have to operate over previously installed Planting Soil. Work in rows of lifts the width of the extension of the bucket on the loader. Install all lifts in one row before proceeding to the next. Work out from the furthest part of each bed from the soil delivery point to the edge of the each bed area.
- F. Where possible place large trees first and fill Planting Soil around the root ball.
- G. Installing soil with soil or mulch blowers or soil slingers shall not be permitted due to the overmixing and soil ped breakdown cause by this type of equipment.
- H. Where travel over installed soil is unavoidable, limit paths of traffic to reduce the impact of compaction in Planting Soil. Each time equipment passes over the installed soil it shall reverse out of the area along the same path with the teeth of the bucket dropped to scarify the soil. Comply with the paragraph "Compaction Reduction" (section 3.9) in the event that soil becomes over compacted.
- I. The depths and grades shown on the drawings are the final grades after settlement and shrinkage of the compost material. The Contractor shall install the Planting Soil at a higher level to anticipate this reduction of Planting Soil volume. A minimum settlement of approximately 10 - 15% of the soil depth is expected. All grade increases are assumed to be as measured prior to addition of surface Compost till layer, mulch, or sod.

3.7 COMPACTION REQUIREMENTS FOR INSTALLED OR MODIFIED PLANTING SOIL

- A. Compact installed Planting Soil to the compaction rates indicated and using the methods approved for the soil mockup. Compact each soil lift as the soil is installed.
- B. Existing soil that is modified by tilling, ripping or fracturing shall have a density to the depth of the modification, after completion of the loosening, such that the penetrometer reads approximately 75 to 250 psi at soil moisture approximately the mid-point between wilting point and field capacity. This will be approximately between 75 and 82% of maximum dry density standard proctor.
- C. Installed Planting Soil Mix and re-spread existing soil shall have a soil density through the required

depth of the installed layers of soil, such that the penetrometer reads approximately 75 to 250 psi at soil moisture approximately the mid-point between wilt point and field capacity. This will be approximately between 75 and 82% of maximum dry density standard proctor.

- D. Planting Soil compaction shall be tested at each lift using a penetrometer calibrated to the mockup soil and its moisture level. The same penetrometer and moisture meter used for the testing of the mockup shall be used to test installed soil throughout the work.
- E. Maintain moisture conditions within the Planting Soil during installation or modification to allow for satisfactory compaction. Suspend operations if the Planting Soil becomes wet. Apply water if the soil is overly dry.
- F. Provide adequate equipment to achieve consistent and uniform compaction of the Planting Soils. Use the smallest equipment that can reasonably perform the task of spreading and compaction. Use the same equipment and methods of compaction used to construct the Planting Soil mockup.
- G. Do not pass motorized equipment over previously installed and compacted soil except as authorized below.
 - 1. Light weight equipment such as trenching machines or motorized wheel barrows is permitted to pass over finished soil work.
 - 2. If work after the installation and compaction of soil compacts the soil to levels greater than the above requirements, follow the requirements of the paragraph "Over Compaction Reduction" below.

3.8 OVER COMPACTION REDUCTION

- A. Any soil that becomes compacted to a density greater than the specified density and/or the density in the approved mockup shall be dug up and reinstalled. This requirement includes compaction caused by other sub-contractors after the Planting Soil is installed and approved.
- B. Surface roto tilling shall not be considered adequate to reduce over compaction at levels 6 inches or greater below finished grade.

3.9 INSTALLATION OF CHEMICAL ADDITIVES

- A. Following the installation of each soil and prior to fine grading and installation of the Compost till layer, apply chemical additives as recommended by the soil test, and appropriate to the soil and specific plants to be installed.
- B. Types, application rates and methods of application shall be approved by the Owner's Representative prior to any applications.

3.10 FINE GRADING

- A. The Owner's Representative shall approve all rough grading prior to the installation of Compost, fine grading, planting, and mulching.
- B. Grade the finish surface of all planted areas to meet the grades shown on the drawings, allowing the finished grades to remain higher (10 – 15% of depth of soil modification) than the grades on the grading plan, as defined in paragraph Planting Soil Installation, to anticipate settlement over the first year.
- C. Utilize hand equipment, small garden tractors with rakes, or small garden tractors with buckets with teeth for fine grading to keep surface rough without further compaction. Do not use the flat bottom of a loader bucket to fine grade, as it will cause the finished grade to become overly smooth and or slightly compressed.
- D. Provide for positive drainage from all areas toward the existing inlets, drainage structures and or the edges of planting beds. Adjust grades as directed to reflect actual constructed field conditions of paving, wall and inlet elevations. Notify the Owner's Representative in the event that conditions make it impossible to achieve positive drainage.

- E. Provide smooth, rounded transitions between slopes of different gradients and direction. Modify the grade so that the finish grade before adding mulch and after settlement is one or two inches below all paving surfaces or as directed by the drawings.
- F. Fill all dips and remove any bumps in the overall plane of the slope. The tolerance for dips and bumps in shrub and ground cover planting areas shall be a 2 inch deviation from the plane in 10 feet. The tolerance for dips and bumps in lawn areas shall be a 1 inch deviation from the plane in 10 feet.

3.11 INSTALLATION OF COMPOST TILL LAYER

- A. After Planting Soil Mixes are installed in planting bed areas and just prior to the installation of shrub or groundcover plantings, spread 3 – 4 inches of Compost over the beds and roto till into the top 4 - 6 inches of the Planting Soil. This step will raise grades slightly above the grades required in paragraph “Fine Grading”. This specification anticipates that the raise in grade due to this tilling will settle within a few months after installation as Compost breaks down. Additional settlement as defined in paragraph “Planting Soil and Planting Soil Mix installation” must still be accounted for in the setting of final grades.

3.12 CLEAN-UP

- A. During installation, keep the site free of trash, pavements reasonably clean and work area in an orderly condition at the end of each day. Remove trash and debris in containers from the site no less than once a week.
 - 1. Immediately clean up any spilled or tracked soil, fuel, oil, trash or debris deposited by the Contractor from all surfaces within the project or on public right of ways and neighboring property.
- B. Once installation is complete, wash all soil from pavements and other structures. Ensure that mulch is confined to planting beds and that all tags and flagging tape are removed from the site. The Owner’s Representative seals are to remain on the trees and removed at the end of the warranty period.
 - 1. Make all repairs to grades, ruts, and damage to the work or other work at the site.
 - 2. Remove and dispose of all excess Planting Soil, subsoil, mulch, plants, packaging, and other material brought to the site by the Contractor.

3.13 PLANTING SOIL AND MODIFIED EXISTING SOIL PROTECTION

- A. The Contractor shall protect installed and/or modified Planting Soil from damage including contamination and over compaction due to other soil installation, planting operations, and operations by other Contractors or trespassers. Maintain protection during installation until acceptance. Utilize fencing and matting as required or directed to protect the finished soil work. Treat, repair or replace damaged Planting Soil immediately.
- B. Loosen compacted Planting Soil and replace Planting Soil that has become contaminated as determined by the Owner’s Representative. Planting Soil shall be loosened or replaced at no expense to the Owner.
 - a. Till and restore grades to all soil that has been driven over or compacted during the installation of plants.
 - b. Where modified existing soil has become contaminated and needs to be replaced, provide imported soil that is of similar composition, depth and density as the soil that was removed.

3.14 PROTECTION DURING CONSTRUCTION

- A. The Contractor shall protect planting and related work and other site work from damage due to planting operations, operations by other Contractors or trespassers.
 - 1. Maintain protection during installation until the date of plant acceptance (see specifications section – Planting). Treat, repair or replace damaged work immediately.
 - 2. Provide temporary erosion control as needed to stop soil erosion until the site is stabilized with mulch, plantings or turf.
- B. Damage done by the Contractor, or any of their sub-contractors to existing or installed plants, or any

other parts of the work or existing features to remain, including large existing trees, soil, paving, utilities, lighting, irrigation, other finished work and surfaces including those on adjacent property, shall be cleaned, repaired or replaced by the Contractor at no expense to the Owner. The Owner's Representative shall determine when such cleaning, replacement or repair is satisfactory. Damage to existing trees shall be assessed by a certified arborist.

3.15 SUBSTANTIAL COMPLETION ACCEPTANCE

- A. Upon written notice from the Contractor, the Owners Representative shall review the work and make a determination if the work is substantially complete.
- B. The date of substantial completion of the planting soil shall be the date when the Owner's Representative accepts that all work in Planting, Planting Soil, and Irrigation installation sections is complete.

3.16 FINAL ACCEPTANCE / SOIL SETTLEMENT

- A. At the end of the plant warrantee and maintenance period, (see Specification section - Planting) the Owner's Representative shall observe the soil installation work and establish that all provisions of the contract are complete and the work is satisfactory.
 - 1. Restore any soil settlement and or erosion areas to the grades shown on the drawings. When restoring soil grades remove plants and mulch and add soil before restoring the planting. Do not add soil over the root balls of plants or on top of mulch.
- B. Failure to pass acceptance: If the work fails to pass final acceptance, any subsequent observations must be rescheduled as per above. The cost to the Owner for additional observations will be charged to the Contractor at the prevailing hourly rate of the Owner's Representative.

END OF SECTION 32 9100

SECTION 32 92 00

TURF AND GRASSES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Fine grading and preparing lawn areas.
 - 2. Furnishing and applying soil amendments.
 - 3. Furnishing and applying fertilizers.
 - 4. Seeding new lawns.
 - 5. Sodding new lawns.

1.3 SUBMITTALS

- A. General: Submit each item in this Article according to the Conditions of the Contract and Division 1 Specification Sections.
- B. Product data for the following:
 - 1. Aluminum sulfate.
 - 2. Fertilizers.
- C. Certification of grass seed from seed vendor for each grass-seed mixture stating the botanical and common name and percentage by weight of each species and variety, and percentage of purity, germination, and weed seed. Include the year of production and date of packaging.
- D. Certification of Sod: From vendor for sod stating the botanical and common name, to source of sprigs including name and contact information of grower.
 - 1. Sod shall be in accordance with South Carolina Turf Standard: **27-196 VEGETATIVELY PROPAGATED TURFGRASS CERTIFICATION STANDARDS** – Clemson University. Certification tag shall accompany sod.
- E. Qualification data for firms and persons specified in the "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and address of architects and owners, and other information specified.
- F. Material test reports from qualified independent testing agency indicating and interpreting test results relative to compliance of the following materials with requirements indicated.

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1. Analysis of existing surface soil and/or imported topsoil. Testing shall be requested 15 working days prior to delivery of topsoil to the work site. Deficiencies in the topsoil shall be corrected by the contractor. Retesting cost shall be at the Contractor's expense.
- G. Planting schedule indicating anticipated dates and locations for each type of planting.
- H. Maintenance instructions recommending procedures to be established by Owner for maintenance of landscaping during an entire year. Submit before expiration of required maintenance periods.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: Engage an experienced Installer who has completed landscaping work similar in material, design, and extent to that indicated for this Project and with a record of successful grass establishment.
 1. Installer's Field Supervision: Require Installer to maintain an experienced full-time supervisor on the Project site during times that grass planting is in progress.
- B. Testing Agency Qualifications: To qualify for acceptance, an independent testing agency must demonstrate to Architect's satisfaction, based on evaluation of agency-submitted criteria conforming to ASTM E 699, that it has the experience and capability to satisfactorily conduct the testing indicated without delaying the Work.
- C. Topsoil Analysis: Furnish a soil analysis made by a qualified independent soil-testing agency stating percentages of organic matter, inorganic matter (silt, clay, and sand), deleterious material, pH, and mineral and plant-nutrient content of topsoil.
 1. Report suitability of topsoil for lawn growth. State recommended quantities of nitrogen, phosphorus, and potash nutrients and any limestone, aluminum sulfate, or other soil amendments to be added to produce a satisfactory topsoil.
- D. Preinstallation Conference: Conduct conference at Project site to comply with requirements of Division 1 Section "Project Meetings."

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Seed: Deliver seed in original sealed, labeled, and undamaged containers.
- B. Turf grass sod: Deliver sod in a timely manner which will allow installation to occur within 48 hours. Notify Architect 48 hours in advance when sod, fertilizer, soil conditioners, soil amendments, and sand will be delivered to the site.
 1. Furnish an itemized list of actual quantities for each type of material. Materials shall be delivered to the site in sealed standard size containers, where applicable showing weight, analysis, name of vendor, and germination test. Materials which have become wet, moldy, or otherwise damaged will not be acceptable. Deliver the necessary inspection certificates to accompany fertilizer, and soil amendment bag. Sod shall be NC Crop Improvements Blue Tag Certified. Certification must accompany sod.
 2. When shipment is made by truck, pack all materials to provide adequate protection against climate and breakage during transit.

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3. When ship is made by rail, pack boxcars carefully and adequately ventilate materials to prevent “sweating” of materials during transit.
Use a suitable method to handle sod to insure careful, workmanlike delivery of materials.
Prevent any damage to pad or pad ends.

1.6 COORDINATION AND SCHEDULING

- A. Planting Season: Sow lawn seed during normal planting seasons for type of lawn work required. Correlate planting with specified maintenance periods to provide required maintenance from date of Substantial Completion.
- B. Weather Limitations: Proceed with planting only when existing and forecast weather conditions are suitable for work.

1.7 MAINTENANCE

- A. Begin maintenance of lawns immediately after each area is planted and continue until acceptable lawn is established, but for not less than the following periods:
 1. Seeded Lawns: 60 days after date of Substantial Completion of entire project.
 - a. When full maintenance period has not elapsed before end of planting season, or if lawn is not fully established at that time, continue maintenance during next planting season.
 2. Sodded Lawns: 30 days after date of Substantial Completion.
- B. Maintain and establish lawns by watering, fertilizing, weeding, mowing, trimming, replanting, and other operations. Roll, regrade, and replant bare or eroded areas and remulch to produce a uniformly smooth lawn.
 1. Replant bare areas with same materials specified for lawns.
 2. Add new mulch in areas where mulch has been disturbed by wind or maintenance operations sufficiently to nullify its purpose. Anchor as required to prevent displacement.
- C. Watering: Insure irrigation system is working and will keep lawns uniformly moist to a depth of 4” (100 mm).
 1. In areas without an irrigation system lay out, a temporary lawn-watering system and arrange watering schedule to prevent wilting, puddling, erosion, and displacement of seed or mulch. Lay out temporary watering system to avoid walking over muddy or newly seeded areas.
 2. Water lawn at the minimum rate of 1 inch (25 mm) per week.
- D. Mow lawns as soon as there is enough top growth to cut with mower set at specified height for principal species planted. Repeat mowing as required to maintain specified height without cutting more than 40 percent of the grass height. Remove no more than 40 percent of grass-leaf growth in initial or subsequent mowings. Do not delay mowing until grass blades bend over and become matted. Do not mow when grass is wet. Schedule initial and subsequent mowings to maintain following grass height:
 1. Mow grass from $\frac{3}{4}$ to 1 inch for bermuda lawns..
- E. Postfertilization: Apply fertilizer to lawn after first mowing and when grass is dry.

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1. Use fertilizer that will provide actual nitrogen of at least 1 lb per 1000 sq. ft. (0.5 kg per 100 sq. m) of lawn area.

PART 2 - PRODUCTS

2.1 SOD

Turfgrass Sod: Sod shall be two years old minimum, free of weeds, insects, and other grasses, fresh, moist, and from a certified sand based sod farm. The species is listed below.

1. Provide sod of uniform pad sizes with maximum 5% deviation in entire length or width, broken pads or pads with uneven ends will not be acceptable. Sod pads incapable of supporting their own weight when suspended vertically with a firm grasp on upper 10% of pad will be rejected.
2. Bermuda Grass (Cynodon Dactylon): Tifway 419.
3. Sod shall have prior approval by Architect and shall consist of NC Crop Improvement Blue Tag Certified Bermuda Grass. Sod shall be fresh cut, delivered and installed within 48 hours, and consist of live, growing plants secured from sources where the soil is fertile and shall have a healthy, virile root system or dense, thickly matted roots throughout the soil of the sod for a minimum of one inch. Sod shall be free from noxious weeds or other grasses and shall not contain any matter deleterious to growth or which might affect its subsistence or hardiness when transplanted. Only sod secured from approved sources by the Architect shall be used.

2.2 SEED

- A. Seed: Grass seed shall be bermuda grass as specified on plans with a a 97% minimum purity and 85% minimum germination, and be free of noxious weed seeds, as certified by the North Carolina Co-op Improvement Association or its approved equivalent. Seed shall be delivered to the site in sealed standard size containers, showing weight, analysis, name of vendor and germination test. Seed which has become wet, moldy or otherwise damaged will not be accepted. New varieties will be considered for review.

1. Seed Type: Bermuda Grass (Cynodon Dactylon): Sunstar Bermuda

2.3 TOPSOIL

- A. Topsoil: Shall be natural, fertile, agricultural soil, capable of sustaining vigorous plant growth. It shall be of uniform composition throughout, with admixture of subsoil. It shall be free of stones, lumps, live plants and their roots, sticks, and other extraneous matter. Topsoil shall not be used while in a frozen or muddy condition.

Topsoil shall contain the following specified percentages of constituents:

Maximum 30% clay (red clay, well pulverized); clay shall be sterile.

Minimum 5% well-rotted sawdust, leaf mold or other approved partially decomposed organic matter.

Maximum 50% silt.

Maximum 45% coarse sand free of rock.

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Topsoil shall have an acidity range of pH 5.0 to 7.0 and shall contain not less than six percent (6%) organic matter, as determined by loss on ignition of moisture-free samples dried at 65 degrees centigrade.

1. Topsoil Source: Reuse surface soil stockpiled on the site. Verify suitability of surface soil to produce topsoil meeting requirements and amend when necessary. Supplement with imported topsoil when quantities are insufficient. Imported topsoil shall come from an area that has good drainage and not from a marsh or bog. A sample of proposed topsoil shall be submitted to the landscape architect 15 calendar days prior to installation and be approved prior to installation.

2.4 SOIL AMENDMENTS

- A. Lime: ASTM C 602, Class T, agricultural limestone containing a minimum 80 percent calcium carbonate equivalent, with a minimum 99 percent passing a No. 8 (2.36 mm) sieve and a minimum 75 percent passing a No. 60 (250 micrometer) sieve.
 1. Provide lime in the form of dolomitic limestone.
- B. Aluminum Sulfate: Commercial grade, unadulterated.
- C. Sand: Clean, washed, natural or manufactured sand, free of toxic materials.
- D. Perlite: Horticultural perlite, soil amendment grade.
- E. Peat Humus: Finely divided or granular texture, with a pH range of 6 to 7.5, composed of partially decomposed moss peat (other than sphagnum), peat humus, or reed-sedge peat.
- F. Sawdust or Ground-Bark Humus: Decomposed, nitrogen-treated, of uniform texture, free of chips, stones, sticks, soil, or toxic materials.
 1. When site treated, mix with at least 0.15 lb (2.4 kg) of ammonium nitrate or 0.25 lb (4 kg) of ammonium sulfate per cu. ft. (cu. m) of loose sawdust or ground bark.
- G. Manure: Well-rotted, unleached stable or cattle manure containing not more than 25 percent by volume of straw, sawdust, or other bedding materials; free of toxic substances, stones, sticks, soil, weed seed, and material harmful to plant growth.
- H. Herbicides: EPA registered and approved, of type recommended by manufacturer.
- I. Water: Potable.

2.5 FERTILIZER

- A. Superphosphate: Commercial, phosphate mixture, soluble; minimum of 20 percent available phosphoric acid.
- B. Commercial Fertilizer: Commercial-grade complete fertilizer of neutral character, consisting of fast- and slow-release nitrogen, 50 percent derived from natural organic sources of urea-form, phosphorous, and potassium in the following composition:
 1. Composition: 1 lb per 1000 sq. ft. (0.5 kg per 100 sq. m) of actual nitrogen, 4 percent phosphorous, and 2 percent potassium, by weight.

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2. Composition: Nitrogen, phosphorous, and potassium in amounts recommended in soil reports from a qualified soil-testing agency.
- C. Slow-Release Fertilizer: Granular fertilizer consisting of 50 percent water-insoluble nitrogen, phosphorus, and potassium in the following composition:
 1. Composition: 20 percent nitrogen, 10 percent phosphorous, and 10 percent potassium, by weight.
 2. Composition: Nitrogen, phosphorous, and potassium in amounts recommended in soil reports from a qualified soil-testing agency.

2.6 MULCHES

- A. Straw Mulch: Provide air-dry, clean, mildew- and seed-free, salt hay or threshed straw of wheat, rye, oats, or barley.
- B. Asphalt Emulsion Tackifier: Asphalt emulsion, ASTM D 977, Grade SS-1, nontoxic and free of plant growth- or germination-inhibitors.

2.7 EROSION-CONTROL MATERIALS

- A. Blankets: Biodegradable wood excelsior, straw, or coconut-fiber mat enclosed in a photodegradable mesh. Include manufacturer's recommended steel wire staples, 6 inches (150 mm) long.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas to receive lawns and grass for compliance with requirements and for conditions affecting performance of work of this Section. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Protect structures, utilities, sidewalks, pavements, and other facilities, trees, shrubs, and plantings from damage caused by planting operations.
- B. Provide erosion-control measures to prevent erosion or displacement of soils and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways.

3.3 PLANTING SOIL PREPARATION

- A. Limit soil preparation to areas that will be planted in the immediate future.
- B. Loosen soil to a minimum depth of 8 inches (100 mm). Remove stones larger than 1 inch (25 mm) in any dimension and sticks, roots, rubbish, and other extraneous matter.
- C. Mix soil amendments and fertilizers with topsoil at rates indicated. Delay mixing fertilizer if planting does not follow within a few days. Apply soil amendments on surface of spread topsoil and mix thoroughly into top 4 inches (100 mm) of topsoil before planting.

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1. A "Planting Soil Amendments Schedule" is included at the end of this Section.
 2. Mix lime with dry soil prior to mixing fertilizer.
 3. Apply superphosphate fertilizer directly to subgrade before tilling, at the rate indicated.
- D. Preparation of Unchanged Grades: Where lawns are to be planted in areas unaltered or undisturbed by excavating, grading, or surface soil stripping operations, prepare soil as follows:
1. Remove and dispose of existing grass, vegetation, and turf. Do not turn over into soil being prepared for lawns.
 2. Till surface soil to a depth of at least 6 inches (150 mm). Apply required soil amendments and initial fertilizers and mix thoroughly into top 4 inches (100 mm) of soil. Trim high areas and fill in depressions. Till soil to a homogenous mixture of fine texture.
 3. Clean surface soil of roots, plants, sod, stones, clay lumps, and other extraneous materials harmful to plant growth.
 4. Remove waste material, including grass, vegetation, and turf, and legally dispose of it off the Owner's property.
- E. Grade lawn and grass areas to a smooth, even surface with loose, uniformly fine texture. Roll and rake, remove ridges, and fill depressions to meet finish grades. Limit fine grading to areas that can be planted in the immediate future. Remove trash, debris, stones larger than 1 inch (25 mm) in any dimension, and other objects that may interfere with planting or maintenance operations.
- F. Moisten prepared lawn areas before planting when soil is dry. Water thoroughly and allow surface to dry before planting. Do not create muddy soil.
- G. Restore prepared areas if eroded or otherwise disturbed after fine grading and before planting.

3.4 SEEDING NEW LAWNS

- A. Sow seed with a spreader or a seeding machine. Do not broadcast or drop seed when wind velocity exceeds 5 mph (8 km/h). Evenly distribute seed by sowing equal quantities in 2 directions at right angles to each other.
1. Do not use wet seed or seed that is moldy or otherwise damaged in transit or storage.
- B. The following schedule will be required for the specified seed type:

<u>Type of Seed</u>	<u>Date</u>
Sunstar Bermuda	Apr. 15 - June 15

Refer to erosion control plans and specs for temporary cover when permanent seeding can not take place due to the wrong time of the year.

Common Bermuda	April 15 – June 15
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- C. Sow seed at the following rates:
2. Sunstar Bermuda: 3 lbs. Per 1000 Sq. Ft.
- D. Rake seed lightly into top 1/8 inch (3 mm) of topsoil, roll lightly, and water with fine spray.
- E. Protect seeded slopes exceeding 1:3 as shown on plan against erosion with erosion-control blankets installed and stapled according to manufacturer's recommendations.

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- F. Protect seeded areas with slopes less than 1:6 against erosion by spreading straw mulch after completion of seeding operations. Spread uniformly at a minimum rate of 2 tons per acre (45 kg per 100 sq. m) to form a continuous blanket 1-1/2 inches (38 mm) loose depth over seeded areas. Spread by hand, blower, or other suitable equipment.
 - 1. Anchor straw mulch by crimping into topsoil by suitable mechanical equipment.
 - 2. Anchor straw mulch by spraying with asphalt-emulsion tackifier at the rate of 10 to 13 gal. per 1000 sq. ft. (41 to 53 L per 100 sq. m). Take precautions to prevent damage or staining of structures or other plantings adjacent to mulched areas. Immediately clean damaged or stained areas.
- G. Protect seeded areas against hot, dry weather or drying winds by applying peat mulch within 24 hours after completion of seeding operations. Soak and scatter uniformly to a depth of 3/16 inch (4.8 mm) thick and roll to a smooth surface.

3.5 SODDING NEW LAWNS

- A. Lay sod within 24 hours of stripping. Do not lay sod if dormant or if ground is frozen.
- B. Lay sod to form a solid mass with tightly fitted joints. Butt ends and sides of sod; do not stretch or overlap. Stagger sod strips or pads to offset joints in adjacent courses. Avoid damage to subgrade or sod during installation. Tamp and roll lightly to ensure contact with subgrade, eliminate air pockets, and form a smooth surface. Work sifted soil or fine sand into minor cracks between pieces of sod; remove excess to avoid smothering sod and adjacent grass.
 - 1. Lay sod across angle of slopes exceeding 1:3.
 - 2. Anchor sod on slopes exceeding 1:6 with wood pegs spaced as recommended by sod manufacturer but not less than 2 anchors per sod strip to prevent slippage.
- C. Saturate sod with fine water spray within 2 hours of planting. During first week, water daily or more frequently as necessary to maintain moist soil to a minimum depth of 1-1/2 inches (38 mm) below the sod.

3.6 SATISFACTORY LAWN

- A. Seeded lawns will be satisfactory provided requirements, including maintenance, have been met and a healthy, uniform, close stand of grass is established, free of weeds, bare spots exceeding 5 by 5 inches (125 by 125 mm), and surface irregularities.
- B. Replant lawns that do not meet requirements and continue maintenance until lawns are satisfactory. This may include replanting in the following growing season if required.

3.7 CLEANUP AND PROTECTION

- A. Promptly remove soil and debris created by lawn work from paved areas. Clean wheels of vehicles before leaving site to avoid tracking soil onto surface of roads, walks, or other paved areas.
- B. Erect barricades and warning signs as required to protect newly planted areas from traffic. Maintain barricades throughout maintenance period until lawn is established.

3.8 PLANTING SOIL AMENDMENTS SCHEDULE

- A. Lawns: Provide soil amendments in not less than the following quantities:
1. Weight of lime per 1000 sq. ft. (100 sq. m): 100 lbs.
 2. Weight of superphosphate per 1000 sq. ft. (100 sq. m): 30 lbs.
 3. Weight of commercial fertilizer per 1000 sq. ft. (100 sq. m): 6 lbs.

Adjust quantities as required per soil test analysis.

3.9 RECONDITIONING LAWNS

- A. Recondition existing lawn areas damaged by Contractor's operations, including storage of materials or equipment and movement of vehicles. Also recondition lawn areas where settlement or washouts occur or where minor regrading is required.
- B. Remove sod and vegetation from diseased or unsatisfactory lawn areas; do not bury into soil. Remove topsoil containing foreign materials resulting from Contractor's operations, including oil drippings, fuel spills, stone, gravel, and other construction materials, and replace with new topsoil.
- C. Where substantial lawn remains, mow, dethatch, core aerate, and rake. Remove weeds before seeding. Where weeds are extensive, apply selective herbicides as required. Do not use pre-emergence herbicides.
- D. Remove waste and foreign materials, including weeds, soil cores, grass, vegetation, and turf, and legally dispose of it off the Owner's property.
- E. Till stripped, bare, and compacted areas thoroughly to a depth of 6 inches (150 mm).
- F. Apply required soil amendments and initial fertilizers and mix thoroughly into top 4 inches (100 mm) of soil. Provide new planting soil as required to fill low spots and meet new finish grades.
- G. Apply seed and protect with straw mulch as required for new lawns.
- H. Apply sod as required for new lawns.
- I. Water newly planted areas and keep moist until new grass is established.

END OF SECTION

SECTION 32 93 00

PLANTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:

- 1. Plants.
- 2. Planting soils.
- 3. Tree stabilization.

- B. Related Sections:

- 1. Division 01 Section "Temporary Tree and Plant Protection" for protecting, trimming, pruning, repairing, and replacing existing trees to remain that interfere with, or are affected by, execution of the Work.
- 2. Division 31 Section "Site Clearing" for protection of existing trees and plantings, topsoil stripping and stockpiling, and site clearing.
- 3. Division 31 Section "Earth Moving" for excavation, filling, and rough grading and for subsurface aggregate drainage and drainage backfill materials.
- 4. Division 32 Section "Turf and Grasses" for turf (lawn) and meadow planting, hydroseeding, and erosion-control materials.

1.3 DEFINITIONS

- A. Backfill: The earth used to replace or the act of replacing earth in an excavation.
- B. Balled and Burlapped Stock: Plants dug with firm, natural balls of earth in which they were grown, with ball size not less than diameter and depth recommended by ANSI Z60.1 for type and size of plant required; wrapped with burlap, tied, rigidly supported, and drum laced with twine with the root flare visible at the surface of the ball as recommended by ANSI Z60.1.
- C. Balled and Potted Stock: Plants dug with firm, natural balls of earth in which they are grown and placed, unbroken, in a container. Ball size is not less than diameter and depth recommended by ANSI Z60.1 for type and size of plant required.
- D. Container-Grown Stock: Healthy, vigorous, well-rooted plants grown in a container, with a well-established root system reaching sides of container and maintaining a firm ball when removed from container. Container shall be rigid enough to hold ball shape and protect root mass during shipping and be sized according to ANSI Z60.1 for type and size of plant required.

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- E. Duff Layer: The surface layer of native topsoil that is composed of mostly decayed leaves, twigs, and detritus.
- F. Fabric Bag-Grown Stock: Healthy, vigorous, well-rooted plants established and grown in-ground in a porous fabric bag with well-established root system reaching sides of fabric bag. Fabric bag size is not less than diameter, depth, and volume required by ANSI Z60.1 for type and size of plant.
- G. Finish Grade: Elevation of finished surface of planting soil.
- H. Manufactured Topsoil: Soil produced off-site by homogeneously blending mineral soils or sand with stabilized organic soil amendments to produce topsoil or planting soil.
- I. Pesticide: A substance or mixture intended for preventing, destroying, repelling, or mitigating a pest. This includes insecticides, miticides, herbicides, fungicides, rodenticides, and molluscicides. It also includes substances or mixtures intended for use as a plant regulator, defoliant, or desiccant.
- J. Pests: Living organisms that occur where they are not desired, or that cause damage to plants, animals, or people. These include insects, mites, grubs, mollusks (snails and slugs), rodents (gophers, moles, and mice), unwanted plants (weeds), fungi, bacteria, and viruses.
- K. Planting Area: Areas to be planted.
- L. Planting Soil: Standardized topsoil; existing, native surface topsoil; existing, in-place surface soil; imported topsoil; or manufactured topsoil that is modified with soil amendments and perhaps fertilizers to produce a soil mixture best for plant growth.
- M. Plant; Plants; Plant Material: These terms refer to vegetation in general, including trees, shrubs, vines, ground covers, ornamental grasses, bulbs, corms, tubers, or herbaceous vegetation.
- N. Root Flare: Also called "trunk flare." The area at the base of the plant's stem or trunk where the stem or trunk broadens to form roots; the area of transition between the root system and the stem or trunk.
- O. Stem Girdling Roots: Roots that encircle the stems (trunks) of trees below the soil surface.
- P. Subgrade: Surface or elevation of subsoil remaining after excavation is complete, or the top surface of a fill or backfill before planting soil is placed.
- Q. Subsoil: All soil beneath the topsoil layer of the soil profile, and typified by the lack of organic matter and soil organisms.
- R. Surface Soil: Soil that is present at the top layer of the existing soil profile at the Project site. In undisturbed areas, the surface soil is typically topsoil; but in disturbed areas such as urban environments, the surface soil can be subsoil.

1.4 SUBMITTALS

- A. Product Data: For each type of product indicated, including soils.
 - 1. Plant Materials: Include quantities, sizes, quality, and sources for plant materials.

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- B. Samples for Verification: For each of the following:
 - 1. Trees and Shrubs: Three samples of each variety and size delivered to the site for review. Maintain approved samples on-site as a standard for comparison.
 - 2. Organic Compost Mulch: 1-quart volume of each organic mulch required; in sealed plastic bags labeled with composition of materials by percentage of weight and source of mulch. Each Sample shall be typical of the lot of material to be furnished; provide an accurate representation of color, texture, and organic makeup.
 - 3. Mineral Mulch: 2 lb of each mineral mulch required, in sealed plastic bags labeled with source of mulch. Sample shall be typical of the lot of material to be delivered and installed on the site; provide an accurate indication of color, texture, and makeup of the material.
 - 4. Tree Staking: Submit method and species to be staked.
- C. Qualification Data: For qualified landscape Installer. Include list of similar projects completed by Installer demonstrating Installer's capabilities and experience. Include project names, addresses, and year completed, and include names and addresses of owners' contact persons.
- D. Product Certificates: For each type of manufactured product, from manufacturer, and complying with the following:
 - 1. Manufacturer's certified analysis of standard products.
 - 2. Analysis of other materials by a recognized laboratory made according to methods established by the Association of Official Analytical Chemists, where applicable.
- E. Material Test Reports: For existing in-place surface soil.
- F. Maintenance Instructions: Recommended procedures to be established by Owner for maintenance of plants during a calendar year. Submit before start of required maintenance periods.
- G. Warranty: Sample of special warranty.

1.5 QUALITY ASSURANCE

- A. Landscape Contractor Qualifications: Installation must be by a NC Certified Landscape Contractor who has completed landscaping work similar in material, design, and extent to that indicated for this Project and with a record of successful tree and shrub establishment.
 - 1. Installer's Field Supervision: Installation must be by a NC Certified Landscape Technician on the Project site during times that tree and shrub planting is in progress.
 - 2. Pesticide Applicator: State licensed, commercial.
- B. Soil-Testing Laboratory Qualifications: An independent or university laboratory, recognized by the State Department of Agriculture, with the experience and capability to conduct the testing indicated and that specializes in types of tests to be performed.
- C. Soil Analysis: For each unamended soil type, furnish soil analysis and a written report by a qualified soil-testing laboratory stating percentages of organic matter; gradation of sand, silt, and clay content; cation exchange capacity; sodium absorption ratio; deleterious material; pH; and mineral and plant-nutrient content of the soil.

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1. Testing methods and written recommendations shall comply with USDA's Handbook No. 60.
 2. The soil-testing laboratory shall oversee soil sampling; with depth, location, and number of samples to be taken per instructions from Architect. Representative samples shall be taken from varied locations for each soil to be used or amended for planting purposes.
 3. Report suitability of tested soil for plant growth.
 - a. Based upon the test results, state recommendations for soil treatments and soil amendments to be incorporated. State recommendations in weight per 1000 sq. ft. or volume per cu. yd. for nitrogen, phosphorus, and potash nutrients and soil amendments to be added to produce satisfactory planting soil suitable for healthy, viable plants.
 - b. Report presence of problem salts, minerals, or heavy metals, including aluminum, arsenic, barium, cadmium, chromium, cobalt, lead, lithium, and vanadium. If such problem materials are present, provide additional recommendations for corrective action.
- D. Provide quality, size, genus, species, and variety of plants indicated, complying with applicable requirements in ANSI Z60.1.
- E. Measurements: Measure according to ANSI Z60.1. Do not prune to obtain required sizes.
1. Trees and Shrubs: Measure with branches and trunks or canes in their normal position. Take height measurements from or near the top of the root flare for field-grown stock and container grown stock. Measure main body of tree or shrub for height and spread; do not measure branches or roots tip to tip. Take caliper measurements 6 inches above the root flare for trees up to 4-inch caliper size, and 12 inches above the root flare for larger sizes.
 2. Other Plants: Measure with stems, petioles, and foliage in their normal position.
- F. Plant Material Observation: Architect may observe plant material either at place of growth or at site before planting for compliance with requirements for genus, species, variety, cultivar, size, and quality. Architect retains right to observe trees and shrubs further for size and condition of balls and root systems, pests, disease symptoms, injuries, and latent defects and to reject unsatisfactory or defective material at any time during progress of work. Remove rejected trees or shrubs immediately from Project site.
1. Notify Architect of sources of planting materials seven days in advance of delivery to site.
- G. Preinstallation Conference: Conduct conference at Project site.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Packaged Materials: Deliver packaged materials in original, unopened containers showing weight, certified analysis, name and address of manufacturer, and indication of conformance with state and federal laws if applicable.
- B. Bulk Materials:
1. Do not dump or store bulk materials near structures, utilities, walkways and pavements, or on existing turf areas or plants.
 2. Provide erosion-control measures to prevent erosion or displacement of bulk materials, discharge of soil-bearing water runoff, and airborne dust reaching adjacent properties, water conveyance systems, or walkways.

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3. Accompany each delivery of bulk fertilizers, lime, and soil amendments with appropriate certificates.
- C. Do not prune trees and shrubs before delivery. Protect bark, branches, and root systems from sunscald, drying, windburn, sweating, whipping, and other handling and tying damage. Do not bend or bind-tie trees or shrubs in such a manner as to destroy their natural shape. Provide protective covering of plants during shipping and delivery. Do not drop plants during delivery and handling.
- D. Handle planting stock by root ball.
- E. Store bulbs, corms, and tubers in a dry place at 60 to 65 deg F until planting.
- F. Deliver plants after preparations for planting have been completed, and install immediately. If planting is delayed more than six hours after delivery, set plants and trees in their appropriate aspect (sun, filtered sun, or shade), protect from weather and mechanical damage, and keep roots moist.
 1. Heel-in bare-root stock. Soak roots that are in dry condition in water for two hours. Reject dried-out plants.
 2. Set balled stock on ground and cover ball with soil, peat moss, sawdust, or other acceptable material.
 3. Do not remove container-grown stock from containers before time of planting.
 4. Water root systems of plants stored on-site deeply and thoroughly with a fine-mist spray. Water as often as necessary to maintain root systems in a moist, but not overly wet condition.

1.7 PROJECT CONDITIONS

- A. Field Measurements: Verify actual grade elevations, service and utility locations, irrigation system components, and dimensions of plantings and construction contiguous with new plantings by field measurements before proceeding with planting work.
- B. Interruption of Existing Services or Utilities: Do not interrupt services or utilities to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary services or utilities according to requirements indicated:
 1. Notify Architect no fewer than two days in advance of proposed interruption of each service or utility.
 2. Do not proceed with interruption of services or utilities without Architect's written permission.
- C. Planting Restrictions: Plant during one of the following periods. Coordinate planting periods with maintenance periods to provide required maintenance from date of Substantial Completion.
 1. Spring Planting: February 15 – April 15.
 2. Fall Planting: October 15 – December 15.
- D. Weather Limitations: Proceed with planting only when existing and forecasted weather conditions permit planting to be performed when beneficial and optimum results may be obtained. Apply products during favorable weather conditions according to manufacturer's written instructions and warranty requirements.

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- E. Coordination with Turf Areas (Lawns): Plant trees, shrubs, and other plants after finish grades are established and before planting turf areas unless otherwise indicated.
 - 1. When planting trees, shrubs, and other plants after planting turf areas, protect turf areas, and promptly repair damage caused by planting operations.

1.8 WARRANTY

- A. Special Warranty: Installer agrees to repair or replace plantings and accessories that fail in materials, workmanship, or growth within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Death and unsatisfactory growth, except for defects resulting from abuse, lack of adequate maintenance, or neglect by Owner, or incidents that are beyond Contractor's control.
 - b. Structural failures including plantings falling or blowing over.
 - c. Faulty performance of tree stabilization.
 - 2. Warranty Periods from Date of Substantial Completion:
 - a. Trees, Shrubs, Vines, and Ornamental Grasses: 12 months.
 - b. Ground Covers, Biennials, Perennials, and Other Plants: 12 months.
 - c. Annuals: Two months.
 - 3. Include the following remedial actions as a minimum:
 - a. Immediately remove dead plants and replace unless required to plant in the succeeding planting season.
 - b. Replace plants that are more than 25 percent dead or in an unhealthy condition at end of warranty period.
 - c. A limit of one replacement of each plant will be required except for losses or replacements due to failure to comply with requirements.
 - d. Provide extended warranty for period equal to original warranty period, for replaced plant material.

1.9 MAINTENANCE SERVICE

- A. Initial Maintenance Service for Trees and Shrubs: Provide maintenance by skilled employees of landscape Installer. Maintain as required in Part 3. Begin maintenance immediately after plants are installed and continue until plantings are acceptably healthy and well established but for not less than maintenance period below.
 - 1. Maintenance Period: Until final acceptance.
- B. Initial Maintenance Service for Ground Cover and Other Plants: Provide maintenance by skilled employees of landscape Installer. Maintain as required in Part 3. Begin maintenance immediately after plants are installed and continue until plantings are acceptably healthy and well established but for not less than maintenance period below.
 - 1. Maintenance Period: Until final acceptance.

PART 2 - PRODUCTS

2.1 PLANT MATERIAL

- A. General: Furnish nursery-grown plants true to genus, species, variety, cultivar, stem form, shearing, and other features indicated in Plant Schedule or Plant Legend shown on Drawings and complying with ANSI Z60.1; and with healthy root systems developed by transplanting or root pruning. Provide well-shaped, fully branched, healthy, vigorous stock, densely foliated when in leaf and free of disease, pests, eggs, larvae, and defects such as knots, sun scald, injuries, abrasions, and disfigurement.
 - 1. Trees with damaged, crooked, or multiple leaders; tight vertical branches where bark is squeezed between two branches or between branch and trunk ("included bark"); crossing trunks; cut-off limbs more than 3/4 inch in diameter; or with stem girdling roots will be rejected.
 - 2. Collected Stock: Do not use plants harvested from the wild, from native stands, from an established landscape planting, or not grown in a nursery unless otherwise indicated.
- B. Provide plants of sizes, grades, and ball or container sizes complying with ANSI Z60.1 for types and form of plants required. Plants of a larger size may be used if acceptable to Architect, with a proportionate increase in size of roots or balls.
- C. Root-Ball Depth: Furnish trees and shrubs with root balls measured from top of root ball, which shall begin at root flare according to ANSI Z60.1. Root flare shall be visible before planting.
- D. If formal arrangements or consecutive order of plants is shown on Drawings, select stock for uniform height and spread, and number the labels to assure symmetry in planting.
- E. Annuals and Biennials: Provide healthy, disease-free plants of species and variety shown or listed, with well-established root systems reaching to sides of the container to maintain a firm ball, but not with excessive root growth encircling the container. Provide only plants that are acclimated to outdoor conditions before delivery and that are in bud but not yet in bloom.

2.2 INORGANIC SOIL AMENDMENTS

- A. Lime: ASTM C 602, agricultural liming material containing a minimum of 80 percent calcium carbonate equivalent and as follows:
 - 1. Class: T, with a minimum of 99 percent passing through No. 8 sieve and a minimum of 75 percent passing through No. 60 sieve.
 - 2. Provide lime in form of ground dolomitic limestone.
- B. Iron Sulfate: Granulated ferrous sulfate containing a minimum of 20 percent iron and 10 percent sulfur.
- C. Aluminum Sulfate: Commercial grade, unadulterated.
- D. Agricultural Gypsum: Minimum 90 percent calcium sulfate finely ground with 90 percent passing through No. 50 sieve.
- E. Sand: Clean, washed, natural or manufactured, and free of toxic materials.

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2.3 ORGANIC SOIL AMENDMENTS

- A. Compost: Well-composted, stable, and weed-free organic matter, pH range of 5.5 to 8; moisture content 35 to 55 percent by weight; 100 percent passing through 3/4-inch sieve; soluble salt content of 5 to 10 decisiemens/m; not exceeding 0.5 percent inert contaminants and free of substances toxic to plantings; and as follows:
 - 1. Organic Matter Content: 50 to 60 percent of dry weight.
 - 2. Feedstock: Agricultural, food, or industrial residuals; biosolids; yard trimmings; or source-separated or compostable mixed solid waste.
- B. Sphagnum Peat: Partially decomposed sphagnum peat moss, finely divided or granular texture, with a pH range of 3.4 to 4.8.
- C. Muck Peat: Partially decomposed moss peat, native peat, or reed-sedge peat, finely divided or of granular texture, with a pH range of 6 to 7.5, and having a water-absorbing capacity of 1100 to 2000 percent.
- D. Wood Derivatives: Decomposed, nitrogen-treated sawdust, ground bark, or wood waste; of uniform texture and free of chips, stones, sticks, soil, or toxic materials.
 - 1. In lieu of decomposed wood derivatives, mix partially decomposed wood derivatives with ammonium nitrate at a minimum rate of 0.15-lb/cu. ft. of loose sawdust or ground bark, or with ammonium sulfate at a minimum rate of 0.25-lb/cu. ft. of loose sawdust or ground bark.
- E. Manure: Well-rotted, unleached, stable or cattle manure containing not more than 25 percent by volume of straw, sawdust, or other bedding materials; free of toxic substances, stones, sticks, soil, weed seed, debris, and material harmful to plant growth.

2.4 FERTILIZERS

- A. Bonemeal: Commercial, raw or steamed, finely ground; a minimum of 4 percent nitrogen and 20 percent phosphoric acid.
- B. Superphosphate: Commercial, phosphate mixture, soluble; a minimum of 20 percent available phosphoric acid.
- C. Commercial Fertilizer: Commercial-grade complete fertilizer of neutral character, consisting of fast- and slow-release nitrogen, 50 percent derived from natural organic sources of urea formaldehyde, phosphorous, and potassium in the following composition:
 - 1. Composition: 1 lb/1000 sq. ft. of actual nitrogen, 4 percent phosphorous, and 2 percent potassium, by weight.
 - 2. Composition: Nitrogen, phosphorous, and potassium in amounts recommended in soil reports from a qualified soil-testing laboratory.
- D. Slow-Release Fertilizer: Granular or pelleted fertilizer consisting of 50 percent water-insoluble nitrogen, phosphorus, and potassium in the following composition:
 - 1. Composition: 20 percent nitrogen, 10 percent phosphorous, and 10 percent potassium, by weight.
 - 2. Composition: Nitrogen, phosphorous, and potassium in amounts recommended in soil reports from a qualified soil-testing laboratory.

2.5 PLANTING SOILS (NON ERICACEOUS PLANTS)

- A. Planting Soil: Existing, in-place surface soil. Verify suitability of existing surface soil to produce viable planting soil. Remove stones, roots, plants, sod, clods, clay lumps, pockets of coarse sand, concrete slurry, concrete layers or chunks, cement, plaster, building debris, and other extraneous materials harmful to plant growth. Mix surface soil with inorganic and organic soil amendments and fertilizers to produce a planting soil with the following specified percentages of constituents:
1. Use 50% of existing, in place surface soil (well pulverized).
 2. Use 10% of imported organic soil amendments
 3. Use 20% of imported silt.
 4. Use 20% of imported sand.
 5. Weight of Superphosphate per 1000 Sq. Ft.: 30 lbs.
 6. Weight of Lime per 1000 Sq. Ft.: 100 lbs.
 7. Weight of Commercial Fertilizer per 1000 Sq. Ft.: per soils test.
 8. Weight of Slow-Release Fertilizer per 1000 Sq. Ft.: per soils test.
- B. After producing the planting soil, the mixture shall have an acidity range of ph 5.0 to 7.0 and shall contain not less than six percent (6%) organic matter, as determined by loss on ignition of moisture – free samples dried at 56 degrees centigrade.

2.6 PLANTING SOILS (ERICACEOUS PLANTS AND SEASONAL COLOR BEDS)

- A. Planting Soil: Existing, in-place surface soil. Verify suitability of existing surface soil to produce viable planting soil. Remove stones, roots, plants, sod, clods, clay lumps, pockets of coarse sand, concrete slurry, concrete layers or chunks, cement, plaster, building debris, and other extraneous materials harmful to plant growth. Mix surface soil with inorganic and organic soil amendments and fertilizers to produce a planting soil with the following specified percentages of constituents:
1. Use 33% of existing, in place surface soil (well pulverized).
 2. Use 33% of imported organic soil amendments
 3. Use 33% of imported sand.
 4. Weight of Superphosphate per 1000 Sq. Ft.: 30 lbs.
 5. Weight of Lime per 1000 Sq. Ft.: 0 lbs (None).
 6. Weight of Commercial Fertilizer per 1000 Sq. Ft.: per soils test.
 7. Weight of Slow-Release Fertilizer per 1000 Sq. Ft.: per soils test.
- B. After producing the planting soil, the mixture shall have an acidity range of ph 5.0 to 7.0 and shall contain not less than six percent (6%) organic matter, as determined by loss on ignition of moisture – free samples dried at 56 degrees centigrade.

2.7 MULCHES-Confirm mulch type with Owner prior to purchase and installation.

- A. Organic Mulch: Free from deleterious materials and suitable as a top dressing of trees and shrubs, consisting of one of the following:
1. Type: Double Hammered Hardwood Mulch.
 2. Color: Natural.

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- B. Compost Mulch: Well-composted, stable, and weed-free organic matter, pH range of 5.5 to 8; moisture content 35 to 55 percent by weight; 100 percent passing through 1-inch sieve; soluble salt content of 2 to 5 decisiemens/m; not exceeding 0.5 percent inert contaminants and free of substances toxic to plantings; and as follows:
 - 1. Organic Matter Content: 50 to 60 percent of dry weight.
 - 2. Feedstock: Agricultural, food, or industrial residuals; biosolids; yard trimmings; or source-separated or compostable mixed solid waste.

2.8 PESTICIDES

- A. General: Pesticide registered and approved by EPA, acceptable to authorities having jurisdiction, and of type recommended by manufacturer for each specific problem and as required for Project conditions and application. Do not use restricted pesticides unless authorized in writing by authorities having jurisdiction.
- B. Pre-Emergent Herbicide (Selective and Non-Selective): Effective for controlling the germination or growth of weeds within planted areas at the soil level directly below the mulch layer.
- C. Post-Emergent Herbicide (Selective and Non-Selective): Effective for controlling weed growth that has already germinated.

2.9 TREE STABILIZATION MATERIALS

- A. Stakes and Guys:
 - 1. Upright and Guy Stakes: Rough-sawn, sound, new hardwood or softwood with specified wood pressure-preservative treatment, free of knots, holes, cross grain, and other defects, 2-by-2-inch nominal by length indicated, pointed at one end.
 - 2. Flexible Ties: Wide rubber or elastic bands or straps of length required to reach stakes or turnbuckles or compression springs.
 - 3. Guys and Tie Wires: ASTM A 641/A 641M, Class 1, galvanized-steel wire, two-strand, twisted, 0.106 inch (2.7mm) in diameter.
 - 4. Tree Tie Webbing: UV-resistant polypropylene or nylon webbing with brass grommets.

2.10 MISCELLANEOUS PRODUCTS

- A. Wood Pressure-Preservative Treatment: AWPA C2, with waterborne preservative for soil and freshwater use, acceptable to authorities having jurisdiction, and containing no arsenic; including ammoniacal copper arsenate, ammoniacal copper zinc arsenate, and chromated copper arsenate.
- B. Antidesiccant: Water-insoluble emulsion, permeable moisture retarder, film forming, for trees and shrubs. Deliver in original, sealed, and fully labeled containers and mix according to manufacturer's written instructions.
- C. Burlap: Non-synthetic, biodegradable.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas to receive plants for compliance with requirements and conditions affecting installation and performance.
 - 1. Verify that no foreign or deleterious material or liquid such as paint, paint washout, concrete slurry, concrete layers or chunks, cement, plaster, oils, gasoline, diesel fuel, paint thinner, turpentine, tar, roofing compound, or acid has been deposited in soil within a planting area.
 - 2. Do not mix or place soils and soil amendments in frozen, wet, or muddy conditions.
 - 3. Suspend soil spreading, grading, and tilling operations during periods of excessive soil moisture until the moisture content reaches acceptable levels to attain the required results.
 - 4. Uniformly moisten excessively dry soil that is not workable and which is too dusty.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.
- C. If contamination by foreign or deleterious material or liquid is present in soil within a planting area, remove the soil and contamination as directed by Architect and replace with new planting soil.

3.2 PREPARATION

- A. Protect structures, utilities, sidewalks, pavements, and other facilities and turf areas and existing plants from damage caused by planting operations.
- B. Install erosion-control measures to prevent erosion or displacement of soils and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways.
- C. Lay out individual tree and shrub locations and areas for multiple plantings. Stake locations, outline areas, adjust locations when requested, and obtain Architect's acceptance of layout before excavating or planting. Make minor adjustments as required.
- D. Lay out plants at locations directed by Architect. Stake locations of individual trees and shrubs and outline areas for multiple plantings.
- E. Apply antidesiccant to trees and shrubs using power spray to provide an adequate film over trunks (before wrapping), branches, stems, twigs, and foliage to protect during digging, handling, and transportation.
 - 1. If deciduous trees or shrubs are moved in full leaf, spray with antidesiccant at nursery before moving and again two weeks after planting.
- F. Wrap trees and shrubs with burlap fabric over trunks, branches, stems, twigs, and foliage to protect from wind and other damage during digging, handling, and transportation.

3.3 PLANTING AREA ESTABLISHMENT

- A. Loosen subgrade of planting areas to the depth shown on the drawings or as required by local landscape ordinance, whichever is greater. Remove stones larger than 1 inch in any dimension

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and sticks, roots, rubbish, and other extraneous matter and legally dispose of them off Owner's property.

1. Apply superphosphate fertilizer directly to subgrade before loosening.
 2. Spread topsoil, apply soil amendments and fertilizer on surface, and thoroughly blend planting soil.
 - a. Delay mixing fertilizer with planting soil if planting will not proceed within a few days.
 - b. Mix lime with dry soil before mixing fertilizer (omit lime for Ericaceous plants and seasonal color beds).
 3. Spread planting soil to the depth shown on drawings or as required by local landscape ordinance, whichever is greater, but not less than required to meet finish grades after natural settlement. Do not spread if planting soil or subgrade is frozen, muddy, or excessively wet.
 - a. Spread approximately one-half the thickness of planting soil over loosened subgrade. Mix thoroughly into top 2 inches of subgrade. Spread remainder of planting soil.
- B. Finish Grading: Grade planting areas to a smooth, uniform surface plane with loose, uniformly fine texture. Roll and rake, remove ridges, and fill depressions to meet finish grades.
- C. Before planting, obtain Architect's acceptance of finish grading; restore planting areas if eroded or otherwise disturbed after finish grading.

3.4 EXCAVATION FOR TREES AND SHRUBS

- A. Planting Pits and Trenches: Excavate circular planting pits with sides sloping inward at a 45-degree angle. Excavations with vertical sides are not acceptable. Trim perimeter of bottom leaving center area of bottom raised slightly to support root ball and assist in drainage away from center. Do not further disturb base. Ensure that root ball will sit on undisturbed base soil to prevent settling. Scarify sides of planting pit smeared or smoothed during excavation.
1. Excavate approximately three times as wide as ball diameter for balled and burlapped or container-grown stock.
 2. Do not excavate deeper than depth of the root ball, measured from the root flare to the bottom of the root ball.
 3. If area under the plant was initially dug too deep, add soil to raise it to the correct level and thoroughly tamp the added soil to prevent settling.
 4. Maintain required angles of repose of adjacent materials as shown on the Drawings. Do not excavate subgrades of adjacent paving, structures, hardscapes, or other new or existing improvements.
 5. Maintain supervision of excavations during working hours.
 6. Keep excavations covered or otherwise protected when unattended by Installer's personnel.
 7. If drain tile is shown on Drawings or required under planting areas, excavate to top of porous backfill over tile.
- B. Subsoil and topsoil removed from excavations may be used as planting soil when amended per planting soil requirement specified herein.

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- C. Obstructions: Notify Architect if unexpected rock or obstructions detrimental to trees or shrubs are encountered in excavations.
- D. Drainage: Notify Architect if subsoil conditions evidence unexpected water seepage or retention in tree or shrub planting pits.
- E. Fill excavations with water and allow to percolate away before positioning trees and shrubs.

3.5 TREE, SHRUB, AND VINE PLANTING

- A. Before planting, verify that root flare is visible at top of root ball according to ANSI Z60.1. If root flare is not visible, remove soil in a level manner from the root ball to where the top-most root emerges from the trunk. After soil removal to expose the root flare, verify that root ball still meets size requirements.
- B. Remove stem girdling roots and kinked roots. Remove injured roots by cutting cleanly; do not break.
- C. Set balled and burlapped stock plumb and in center of planting pit or trench with root flare 2 inches above adjacent finish grades.
 - 1. Use planting soil for backfill.
 - 2. After placing some backfill around root ball to stabilize plant, carefully cut and remove burlap, rope, and wire baskets from tops of root balls and from sides, but do not remove from under root balls. Remove pallets, if any, before setting. Do not use planting stock if root ball is cracked or broken before or during planting operation.
 - 3. Backfill around root ball in layers, tamping to settle soil and eliminate voids and air pockets. When planting pit is approximately one-half filled, water thoroughly before placing remainder of backfill. Repeat watering until no more water is absorbed.
 - 4. Place planting tablets in each planting pit when pit is approximately one-half filled; in amounts recommended in soil reports from soil-testing laboratory. Place tablets beside the root ball about 1 inch from root tips; do not place tablets in bottom of the hole.
 - 5. Continue backfilling process. Water again after placing and tamping final layer of soil.
- D. Set container-grown stock plumb and in center of planting pit or trench with root flare 2 inches above adjacent finish grades.
 - 1. Use planting soil for backfill.
 - 2. Carefully remove root ball from container without damaging root ball or plant.
 - 3. Backfill around root ball in layers, tamping to settle soil and eliminate voids and air pockets. When planting pit is approximately one-half filled, water thoroughly before placing remainder of backfill. Repeat watering until no more water is absorbed.
 - 4. Place planting tablets in each planting pit when pit is approximately one-half filled; in amounts recommended in soil reports from soil-testing laboratory. Place tablets beside the root ball about 1 inch from root tips; do not place tablets in bottom of the hole.
 - 5. Continue backfilling process. Water again after placing and tamping final layer of soil.
- E. When planting on slopes, set the plant so the root flare on the uphill side is flush with the surrounding soil on the slope; the edge of the root ball on the downhill side will be above the surrounding soil. Apply enough soil to cover the downhill side of the root ball.

3.6 TREE, SHRUB, AND VINE PRUNING

- A. Remove only dead, dying, or broken branches. Do not prune for shape.
- B. Prune, thin, and shape trees, shrubs, and vines as directed by Architect.
- C. Prune, thin, and shape trees, shrubs, and vines according to standard professional horticultural and arboricultural practices. Unless otherwise indicated by Architect, do not cut tree leaders; remove only injured, dying, or dead branches from trees and shrubs; and prune to retain natural character.
- D. Do not apply pruning paint to wounds.

3.7 TREE STABILIZATION

- A. Contractor to stake trees and large shrubs as necessary to protect root balls from moving during grow in period and keep trunks plumb. Install trunk stabilization as follows unless otherwise indicated:
 - 1. Upright Staking and Typing: Stake trees of 2- through 5-inch caliper. Stake trees of less than 2-inch caliper only as required to prevent wind tip out. Use a minimum of two stakes of length required to penetrate at least 18 inches below bottom of backfilled excavation and to extend to the dimension shown on Drawings above grade. Set vertical stakes and space to avoid penetrating root balls or root masses.
 - 2. Use two stakes for trees up to 12 feet high and 2-1/2 inches or less in caliper; three stakes for trees less than 14 feet high and up to 4 inches in caliper. Space stakes equally around trees.
- B. Staking and Guying: Securely attach no fewer than three guys to stakes 30 inches long, driven grade.
 - 1. Staking and Guying Method:
 - a. Support trees with bands of flexible ties at contact points with tree trunk and reaching to turnbuckle or compression spring. Allow enough slack to avoid rigid restraint of tree.
 - b. Support trees with strands of cable or multiple strands of tie wire, connected to the brass grommets of tree-tie webbing at contact points with tree trunk and reaching to turnbuckle. Allow enough slack to avoid rigid restraint of tree.
 - c. Attach flags to each guy wire, 30 inches above finish grade.

3.8 GROUND COVER AND PLANT PLANTING

- A. Set out and space ground cover and plants other than trees, shrubs, and vines as indicated on drawings in even rows with triangular spacing.
- B. Use planting soil for backfill.
- C. Dig holes large enough to allow spreading of roots.
- D. For rooted cutting plants supplied in flats, plant each in a manner that will minimally disturb the root system but to a depth not less than two nodes.

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- E. Work soil around roots to eliminate air pockets and leave a slight saucer indentation around plants to hold water.
- F. Water thoroughly after planting, taking care not to cover plant crowns with wet soil.
- G. Protect plants from hot sun and wind; remove protection if plants show evidence of recovery from transplanting shock.

3.9 PLANTING AREA MULCHING

- A. Mulch backfilled surfaces of planting areas and other areas indicated.
 - 1. Trees and Tree-like Shrubs in Turf Areas: Apply organic mulch ring of 3-inch average thickness, with 36-inch radius around trunks or stems. Do not place mulch within 3 inches of trunks or stems.
 - 2. Organic Mulch in Planting Areas: Apply 3-inch average thickness of organic mulch extending 12 inches beyond edge of individual planting pit or trench and over whole surface of planting area, and finish level with adjacent finish grades. Do not place mulch within 3 inches of trunks or stems.

3.10 EDGING INSTALLATION

- A. Separate mulched areas from turn areas, curbs and paving with a 45 degree, 4 to 6 inch deep, shovel-cut edge unless noted otherwise on drawings.

3.11 PLANT MAINTENANCE

- A. Maintain plantings by pruning, cultivating, watering, weeding, fertilizing, mulching, restoring planting saucers, adjusting and repairing tree-stabilization devices, resetting to proper grades or vertical position, and performing other operations as required to establish healthy, viable plantings. Spray or treat as required to keep trees and shrubs free of insects and disease.
- B. Fill in as necessary soil subsidence that may occur because of settling or other processes. Replace mulch materials damaged or lost in areas of subsidence.
- C. Apply treatments as required to keep plant materials, planted areas, and soils free of pests and pathogens or disease. Use integrated pest management practices whenever possible to minimize the use of pesticides and reduce hazards. Treatments include physical controls such as hosing off foliage, mechanical controls such as traps, and biological control agents.

3.12 PESTICIDE APPLICATION

- A. Apply pesticides and other chemical products and biological control agents in accordance with authorities having jurisdiction and manufacturer's written recommendations. Coordinate applications with Owner's operations and others in proximity to the Work. Notify Owner before each application is performed.
- B. Pre-Emergent Herbicides (Selective and Non-Selective): Apply to tree, shrub, and ground cover areas in accordance with manufacturer's written recommendations. Do not apply to seeded areas.

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- C. Post-Emergent Herbicides (Selective and Non-Selective): Apply only as necessary to treat already-germinated weeds and in accordance with manufacturer's written recommendations.

3.13 CLEANUP AND PROTECTION

- A. During planting, keep adjacent paving and construction clean and work area in an orderly condition.
- B. Protect plants from damage due to landscape operations and operations of other contractors and trades. Maintain protection during installation and maintenance periods. Treat, repair, or replace damaged plantings.
- C. After installation and before Substantial Completion, remove nursery tags, nursery stakes, tie tape, labels, wire, burlap, and other debris from plant material, planting areas, and Project site.

3.14 DISPOSAL

- A. Remove surplus soil and waste material including excess subsoil, unsuitable soil, trash, and debris and legally dispose of them off Owner's property.

END OF SECTION

SECTION 33 05 13

STORM DRAINAGE MANHOLES, FRAMES, AND COVERS

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Junction box and accessories.
- B. Related Sections:
 - 1. Section 321313– Concrete Paving.

1.2 REFERENCES

- A. ACI (American Concrete Institute) 530 - Building Code Requirements for Masonry Structures.
- B. ASTM A48 - Gray Iron Castings.
- C. ASTM A536 - Ductile Iron Castings.
- D. ASTM C39 - Test Method for Compressive Strength of cylindrical Concrete Specimens.
- E. ASTM C62 - Building Brick (Solid Masonry Units Made from Clay or Shale).

1.3 SUBMITTALS

- A. Section 013000 – Administrative Requirements.

1.4 QUALITY ASSURANCE

- A. Perform Work in accordance with of Georgia Department of Transportation standards.

1.5 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing products specified in this Section with minimum three years documented experience.
- B. Knockout boxes not permitted.

1.6 ENVIRONMENTAL REQUIREMENTS

- A. Maintain materials and surrounding air temperature to minimum 50 degrees F prior to, during, and 48 hours after completion of masonry work.

PART 2 - PRODUCTS

2.1 MANHOLES, FRAMES, AND COVERS

- A. Manufacturers:
 - 1. Per SCDOT Specifications.
 - 2. Per details on plans.
- B. Clay Brick Units: SCDOT Specifications
- C. Mortar and Grout: SCDOT Specifications - Mortar and Grout.

2.2 COMPONENTS

- A. Lid and Frame: ASTM A48, Class 30B Cast iron construction, machined flat bearing surface, removable lid.
- B. Manhole Steps: Formed galvanized steel rungs; $\frac{3}{4}$ inch diameter.
- C. Base Pad: Cast-in-place concrete of type specified in detail on drawing.

2.3 CONFIGURATION

- A. Shaft Construction: Concentric with concentric cone top section.
- B. Shape: Square.
- C. Clear Inside Dimensions: As indicated on drawing.
- D. Design Depth: As indicated on drawings.
- E. Pipe Entry: Provide openings as indicated.
- F. Steps: 12 inches wide, 16 inches on center vertically, set into manhole wall.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify items provided by other sections of Work are properly sized and located.
- B. Verify that built-in items are in proper location, and ready for roughing into Work.
- C. Verify excavation for manholes is correct.

3.2 PREPARATION

- A. Coordinate placement of inlet and outlet pipe or duct sleeves required by other sections.

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- B. Do not install structures under site conditions known to result in loads heavier than that for which the structure was designed.

3.3 INSTALLATION

- A. Excavation and Backfill:
 - 1. Excavate for manholes and drainage structures in accordance with Section 312316 in the location and to depth shown. Provide clearance around the sidewalls of the structure as required for construction.
 - 2. If groundwater is encountered, prevent accumulation of water in excavations. Place manholes or drainage structures in a dry trench.
 - 3. Where the possibility exists of a watertight structure becoming buoyant in a flooded excavation, take necessary steps to avoid flotation of the structure.

3.4 MASONRY MANHOLE INSTALLATION

- A. Maintain masonry courses to uniform dimension. Form vertical and horizontal joints of uniform thickness.
- B. Lay masonry units in running bond. Course one unit and one mortar joint to equal 8 inches.
- C. Form flush mortar joints.
- D. Lay masonry units in full bed of mortar, with full head joints, uniformly jointed with other Work.
- E. Install joint reinforcement 16 inches oc.
- F. Place joint reinforcement in first and second horizontal joints above base pad and below lid frame opening.
- G. As Work progresses, build in fabricated metal items.
- H. Cut and fit for pipe.
- I. Set cover frames and covers level without tipping, to correct elevations.
- J. Grout base of shaft sections to achieve slope to exit piping. Trowel smooth. Contour as required.
- K. Coordinate with other sections of Work to provide correct size, shape, and location.

3.5 CASTINGS INSTALLATION

- A. Set frames using mortar and masonry as required. Radially laid concrete brick shall have $\frac{1}{4}$ inch thick vertical joints at inside perimeter. Lay all concrete brick in a full bed of mortar and completely fill all joints. Where more than one course of concrete brick is required, stagger vertical joints.
- B. Set frame and cover 2 inches above finished grade for manholes and other structures with covers located within unpaved areas to allow the area to be graded away from the cover beginning 1 inch below the top surface of the frame.

3.6 FIELD QUALITY CONTROL

- A. Section 014000 – Quality Requirements: Testing and inspection services.
- B. Vertical Adjustment of Existing Manhole and Drainage Structures:
 - 1. Where required, adjust the top elevation of existing manholes and drainage structures to suit finished grades shown on the Contract Drawings.
 - 2. Reset existing frames, grates and covers, carefully removed, cleaned of all mortar fragments, to the required elevation in accordance with the requirements specified for installation of castings.
 - 3. Remove the concrete so as not to damage the existing vertical reinforcing bars when removal of an existing concrete wall is required. The vertical bars shall be cleaned of all concrete and bent into the new concrete top slab or spliced to required vertical reinforcement, as shown on the Contract Drawings.
 - 4. Clean and apply sand-cement bonding compound on all existing concrete surfaces to receive cast-in-place concrete.
 - 5. For all Nyoplast basins; install top of structure 1.0-feet above plan elevations, final elevation to be field set at end of construction.

END OF SECTION

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PIPE CULVERTS & DRAINAGE STRUCTURES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes site storm sewerage drainage piping, grate traps, drop inlets, fittings and accessories, and bedding; connection of drainage system to municipal sewers.
- B. Related Sections:
 - 1. Section 310513 – Soils for Earthwork
 - 2. Section 310516 – Aggregate for Earthwork
 - 3. Section 312317 - Trenching.

1.2 REFERENCES

- A. ASTM C76 - Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe.
- B. ASTM C443 - Joints for Circular Concrete Sewer and Culvert Pipe, Using Rubber Gaskets.
- C. ASTM C923 – Resilient Connectors between Reinforced Concrete Manhole Structures, Pipes, Laterals.
- D. ASTM C924 - Practice for Testing Concrete Pipe Sewer Lines by Low Pressure Air Test Method.
- E. ASTM C969 - Practice for Infiltration and Exfiltration Acceptance Testing of Installed Precast Concrete Pipe Sewer Lines.
- F. ASTM C1103 - Practice for Joint Acceptance Testing of Installed Precast Pipe Sewer Lines.
- G. ASTM D698 - Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures, Using 5.5-lb Rammer and 12-inch Drop.
- H. ASTM D2321 - Recommended Practice for Underground Installation of Flexible Thermoplastic Sewer Pipe.
- I. ASTM D2922 - Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).
- J. ASTM D3017 - Test Methods for Moisture Content of Soil and Soil-Aggregate Mixtures.
- K. ASTM A-48-83 – Ductile and cast iron grates class 30B.
- M. South Carolina Department of Transportation Standard Specifications.
- N. AASHTO M330 (12-60 inch [300mm-1500mm]), ASTM F2881 (12-60 inch) - Corrugated smooth interior polypropylene (PP) pipe

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- O. AASHTO M252 (4-10 inch), AASHTO M294 (12-60 inch), ASTM F2306 (12-60 inch) - Corrugated, smooth interior, high-density polyethylene (HDPE) pipe
- P. AASHTO M 252, AASHTO M 294, ASTM F 405, ASTM F 606 - Single Wall Pipe (A)

1.3 SUBMITTALS

- A. Manufacturer's Installation Instructions: Submit special procedures required to install Products specified.
- B. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.
- C. Provide detailed shop drawings for all drainage structures.

1.4 CLOSEOUT SUBMITTALS

- A. Project Record Documents:
 - 1. Accurately record on a to-scale as-built set the actual locations of pipe runs, connections, drainage structures, cleanouts, and invert elevations.

1.5 COORDINATION

- A. Coordinate storm sewer installation with plumbing and field drainage system plans.
- B. Verify all existing and proposed conditions prior to construction. Contact Engineer immediately with any discrepancies.
- C. Coordinate wet well fabrication in advance with pump manufacturer to confirm all dimensions.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Storm Sewer Pipe Materials (Gravity Drains):
 - 1. Reinforced Concrete Pipe: ASTM C76, Class III, where specified with Wall Type B, bar reinforcement; Bell & Spigot end joints.

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2. Reinforced Concrete Pipe Joint Device: ASTM C443, rubber compression (O-ring) gasket joint (water tight required).
4. PVC Storm Drain: SDR 26 with gasketed joint meeting ASTM D3212
5. HP Storm - Dual Wall - PP Pipe - Corrugated smooth interior polypropylene (PP) pipe or approved equal. (Labeled "HP" on plans)
6. HDPE Storm Pipe - Corrugated, smooth interior, high-density polyethylene (HDPE) pipe per ADS-N12 pipe or approved equivalent. (Labeled "HDPE" on plans)
7. FLEXSTORM® Catch Basin & Curb Inlet Filters
8. SCDOT Storm Structures per table in section 2.2

2.2 DRAINAGE STRUCTURES

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BASIN #	TYPE
1	HEADWALL PER GODT STD 1125
2	STORM MANHOLE - SPECIAL DESIGN
3	STORM MANHOLE - SPECIAL DESIGN
4	STORM MANHOLE - SPECIAL DESIGN
5	JUNCTION BOX - SPECIAL DESIGN
6	NO STRUCTURE
7	DROP INLET PER SCDOT STD
8	NO STRUCTURE
9	STORM MANHOLE NYOPLAST 36" BASIN
10	DROP INLET PER SCDOT STD
11	JUNCTION BOX PER SCDOT STD - MODIFIED
12	DROP INLET PER SCDOT STD
13	DROP INLET PER SCDOT STD
14	HEADWALL PER GDOT STD 1125 MODIFIED TOP ELEV
15	HEADWALL PER GDOT STD 1125
16	24" NYOPLAST BASIN WITH 24" STD GRATE
17	18" NYPLAST INLINE DRAIN WITH 18" STD GRATE
18	18" NYPLAST INLINE DRAIN WITH 18" STD GRATE
19	18" NYPLAST INLINE DRAIN WITH 18" STD GRATE
20	18" NYPLAST INLINE DRAIN WITH 18" STD GRATE
21	18" NYOPLAST BASIN WITH 18" STD GRATE
22	18" NYOPLAST BASIN WITH 18" STD GRADE
23	24" NYOPLAST MANHOLE WITH 24" SOLID TOP
24	15" NYOPLAST BASIN WITH 15" STD GRATE
25	18" NYOPLAST BASIN WITH 18" DOME GRATE
26	NO STRUCTURE
27	18" NYOPLAST BASIN WITH 18" DOME GRATE
28	NO STRUCTURE
29	NO STRUCTURE
30	15" NYOPLAST BASIN WITH 15" STD GRATE

Continued on next page...

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31	15" NYOPLAST BASIN WITH 15" STD GRATE
32	15" NYOPLAST BASIN WITH 15" STD GRATE
33	15" NYOPLAST BASIN WITH 15" STD GRATE
34	12" NYOPLAST BASIN WITH 12" STD GRATE
35	15" NYOPLAST BASIN WITH 15" STD GRATE
36	15" NYOPLAST BASIN WITH 15" STD GRATE
37	15" NYOPLAST BASIN WITH 15" STD GRATE
38	18" NYOPLAST BASIN WITH 18" STD GRADE
39	CURB INLET PER SCDOT TYPE 16
40	CURB INLET PER SCDOT TYPE 16
41	NO STRUCTURE
42	NO STRUCTURE
43	CURB INLET PER SCDOT TYPE 16
44	CURB INLET PER SCDOT TYPE 16
45	CURB INLET PER SCDOT TYPE 16
46	18" NYOPLAST BASIN WITH 18" STD GRADE
47	18" NYOPLAST BASIN WITH 18" DOME GRATE
48	CURB INLET PER SCDOT TYPE 16
49	18" NYOPLAST BASIN WITH 18" DOME GRATE
50	DROP INLET PER SCDOT STD - MODIFIED ROUND
51	15" NYOPLAST BASIN WITH 15" STD GRATE
52	12" NYOPLAST BASIN WITH 12" STD GRATE
53	12" NYOPLAST BASIN WITH 12" STD GRATE

2.3 BEDDING AND COVER MATERIALS

- A. Bedding: Fill Type A1 as specified in Section 310516.
- B. Cover: Fill Type S1, as specified in Section 310513.

PART 3- EXECUTION

3.1 EXAMINATION

- A. Verify that trench cut is ready to receive work and excavations, dimensions, and elevations are as indicated on drawings.

3.2 PREPARATION

- A. Hand trim excavations to required elevations. Correct over excavation with Type A2 aggregate uniformly placed and compacted, unless otherwise directed by the Geotechnical Engineer.

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- B. Remove large stones or other hard matter which could damage piping or impede consistent backfilling or compaction.
- C. Do not install structures under site conditions known to result in loads heavier than that for which the structure was designed.

3.3 INSTALLATION

- A. Excavation and Backfill:
 - 1. Excavate for manholes and drainage structures in accordance with Section 312316 in the location and to depth shown. Provide clearance around the sidewalls of the structure as required for construction.
 - 2. If groundwater is encountered, prevent accumulation of water in excavations. Place manholes or drainage structures in a dry trench.
 - 3. Where the possibility exists of a watertight structure becoming buoyant in a flooded excavation, take necessary steps to avoid flotation of the structure.
 - 4. Uniformly place and compact 8-inches minimum coarse aggregate bedding/foundation material prior to setting structure.
- B. Unless otherwise noted in the construction plans, set frame and cover 2 inches above finished grade for manholes and other structures with covers located within unpaved areas to allow the area to be graded away from the cover beginning 1 inch below the top surface of the frame.
- C. Top elevations shown in plans are approximate. Construct top elevations to match finished grade in paved areas.

3.4 BEDDING-STORM SEWER PIPE

- A. Hand trim excavation for accurate placement of pipe to elevations indicated.
- B. If unstable subgrade is encountered, remove to the depth required by the Geotechnical Engineer. Replace with type A2 material or as directed by the Geotechnical Engineer.
- C. Uniformly place and compact aggregate bedding material at trench bottom, level materials in continuous layer not exceeding 6 inches compacted depth.
- D. Maintain optimum moisture content of bedding material to attain required compaction density.

3.5 INSTALLATION - PIPE

- A. Lay pipe to slope gradients noted on drawings with maximum variation from true slope of 1/8-inch.
- B. Uniformly place and compact aggregate in haunch zone.
- C. Do not displace or damage pipe when compacting.

3.6 FIELD QUALITY CONTROL

- A. Request inspection prior to backfilling over pipe.

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- B. Compaction testing of Type S1 material will be performed in accordance with ASTM D698 to subgrade elevation.
- C. If tests indicate Work does not meet specified requirements, remove Work, replace and retest.
- D. Frequency of Tests: 1 test / 50 l.f. / 1-foot of backfill.

3.7 PROTECTION OF FINISHED WORK

- A. Protect pipe and aggregate cover from damage or displacement until backfilling operation is in progress.
 - 1. Take care not to damage or displace installed pipe and joints during construction of pipe supports, backfilling, testing, and other operations.
 - 2. Where pipe is damaged or displaced, take remedial measures as directed by the Engineer including, but not limited to, retesting of joints, relaying pipe or replacing pipe. Provide remedial measures at no additional cost to the Owner.

END OF SECTION

ADS N-12[®] ST IB PIPE (PER AASHTO) SPECIFICATION

Scope

This specification describes 4- through 60-inch (100 to 1500 mm) ADS N-12 ST IB pipe (per AASHTO) for use in gravity-flow land drainage applications.

Pipe Requirements

ADS N-12 ST IB pipe (per AASHTO) shall have a smooth interior and annular exterior corrugations.

- 4- through 10-inch (100 to 250 mm) pipe shall meet AASHTO M252, Type S or SP.
- 12- through 60-inch (300 to 1500 mm) pipe shall meet AASHTO M294, Type S or SP, or ASTM F2306.
- Manning’s “n” value for use in design shall be 0.012.

Joint Performance

Pipe shall be joined using a bell & spigot joint meeting the requirements of AASHTO M252, AASHTO M294, or ASTM F2306. The joint shall be soil-tight and gaskets for diameters 12- through 60-inch, shall meet the requirements of ASTM F477. For diameters 4- through 10-inch, the joint shall be soil-tight using an engaging dimple connection. Gaskets shall be installed by the pipe manufacturer and covered with a removable, protective wrap to ensure the gasket is free from debris. A joint lubricant available from the manufacturer shall be used on the gasket and bell during assembly.

Fittings

Fittings shall conform to AASHTO M252, AASHTO M294, or ASTM F2306. Bell and spigot connections shall utilize a spun-on or welded bell and valley or saddle gasket meeting the soil-tight joint performance requirements of AASHTO M252, AASHTO M294, or ASTM F2306.

Material Properties

Material for pipe and fitting production shall be high density polyethylene conforming with the minimum requirements of cell classification 424420C for 4- through 10-inch (100 to 250 mm) diameters, and 435400C for 12- through 60-inch (300 to 1500 mm) diameters, as defined and described in the latest version of ASTM D3350, except that carbon black content should not exceed 4%. The 12- through 60-inch (300 to 1500 mm) pipe material shall comply with the notched constant ligament-stress (NCLS) test as specified in Sections 9.5 and 5.1 of AASHTO M294 and ASTM F2306, respectively.

Installation

Installation shall be in accordance with ASTM D2321 and ADS recommended installation guidelines, with the exception that minimum cover in trafficked areas for 4- through 48-inch (100 to 1200 mm) diameters shall be one foot. (0.3 m) and for 60-inch (1500 mm) diameter the minimum cover shall be 2 ft. (0.6 m) in single run applications. Backfill for minimum cover situations shall consist of Class 1 (compacted), Class 2 (minimum 90% SPD) or Class 3 (minimum 95% SPD) material. Maximum fill heights depend on embedment material and compaction level; please refer to Technical Note 2.01. Contact your local ADS representative or visit our website at www.ads-pipe.com for a copy of the latest installation guidelines.

Pipe Dimensions

	Nominal Diameter, in (mm)												
Pipe I.D. in (mm)	4 (100)	6 (150)	8 (200)	10 (250)	12 (300)	15 (375)	18 (450)	24 (600)	30 (750)	36 (900)	42 (1050)	48 (1200)	60 (1500)
Pipe O.D.* in (mm)	4.8 (122)	6.9 (175)	9.1 (231)	11.4 (290)	14.5 (368)	18 (457)	22 (559)	28 (711)	36 (914)	42 (1067)	48 (1219)	54 (1372)	67 (1702)

*Pipe O.D. values are provided for reference purposes only, values stated for 12 through 60-inch are ±1 inch. Contact a sales representative for exact values

**All diameters available with or without perforations.

ADS HP STORM 12”- 60” PIPE SPECIFICATION

Scope

This specification describes 12- through 60-inch (300 to 1500 mm) ADS HP Storm pipe for use in gravity-flow storm drainage applications.

Pipe Requirements

ADS HP Storm pipe shall have a smooth interior and annular exterior corrugations.

- 12- through 60-inch (300 to 1500 mm) pipe shall meet ASTM F2881 or AASHTO M330
- Manning’s “n” value for use in design shall be 0.012

Joint Performance

Pipe shall be joined using a bell & spigot joint meeting the requirements of ASTM F2881 or AASHTO M330. The joint shall be watertight according to the requirements of ASTM D3212. Gaskets shall meet the requirements of ASTM F477. Gasket shall be installed by the pipe manufacturer and covered with a removable, protective wrap to ensure the gasket is free from debris. A joint lubricant available from the manufacturer shall be used on the gasket and bell during assembly. 12- through 60-inch (300 to 1500 mm) diameters shall have an exterior bell wrap installed by the manufacturer.

Fittings

Fittings shall conform to ASTM F2881 or AASHTO M330. Bell and spigot connections shall utilize a welded or integral bell and valley or inline gaskets meeting the watertight joint performance requirements of ASTM D3212.

Field Pipe and Joint Performance

To assure watertightness, field performance verification may be accomplished by testing in accordance with ASTM F1417 or ASTM F2487. Appropriate safety precautions must be used when field-testing any pipe material. Contact the manufacturer for recommended leakage rates.

Material Properties

Polypropylene compound for pipe and fitting production shall be impact modified copolymer meeting the material requirements of ASTM F2881, Section 5 and AASHTO M330, Section 6.1.

Installation

Installation shall be in accordance with ASTM D2321 and ADS recommended installation guidelines, with the exception that minimum cover in traffic areas for 12- through 48-inch (300 to 1200 mm) diameters shall be one foot (0.3 m) and for 60-inch (1500 mm) diameter the minimum cover shall be 2 ft. (0.6 m) in single run applications. Backfill for minimum cover situations shall consist of Class 1 (compacted), Class 2 (minimum 90% SPD), or Class 3 (minimum 95%) material. Maximum fill heights depend on embedment material and compaction level; please refer to Technical Note 2.04. Contact your local ADS representative or visit our website at www.ads-pipe.com for a copy of the latest installation guidelines.

Pipe Dimensions

Nominal Pipe I.D. in (mm)	12 (300)	15 (375)	18 (450)	24 (600)	30 (750)	36 (900)	42 (1050)	48 (1200)	60 (1500)
Average Pipe I.D. in (mm)	12.2 (310)	15.1 (384)	18.2 (462)	24.1 (612)	30.2 (767)	36.0 (914)	42.0 (1067)	47.9 (1217)	59.9 (1521)
Average Pipe O.D. in (mm)	14.5 (368)	17.7 (450)	21.4 (544)	28.0 (711)	35.5 (902)	41.5 (1054)	47.4 (1204)	54.1 (1374)	67.1 (1704)
Minimum Pipe Stiffness * @ 5% Deflection #/in./in. (kN/m ²)	75 (517)	60 (414)	56 (386)	50 (345)	46 (317)	40 (276)	35 (241)	35 (241)	30 (207)

*Minimum pipe stiffness values listed; contact a representative for average values.