

**CONTRACT DOCUMENTS  
AND  
TECHNICAL SPECIFICATIONS**

**FOR  
PHASE I IMPROVEMENTS  
FLORENCE COUNTY INDUSTRIAL PARK EAST**

**INVITATION-TO-BID No. 22-20/21**

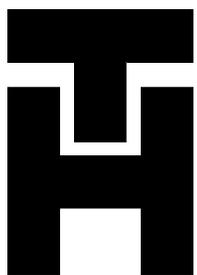
**BID OPENING: JUNE 1, 2021 AT 2:00 P.M.  
(EST)**

**PREPARED FOR  
FLORENCE COUNTY ECONOMIC  
DEVELOPMENT PARTNERSHIP**

**REFERENCE ONLY**



**MAY 2021  
J-28601.0001**



Prepared by:

**THOMAS & HUTTON**

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REFERENCE ONLY

**DOCUMENT 00021****INVITATION TO BID FOR BID NO. 22-20/21 Phase I Improvements Florence County Industrial Park East**

Florence County, South Carolina is accepting bids from qualified Contractors for the Phase I Improvements Florence County Industrial Park East, located in Florence County.

Each of the bidders shall fully familiarize itself with the conditions relating to the bid to ensure complete understanding of all the details involved. The bidder shall satisfy itself as to the actual requirements of the bid by personal examination of its location or other means, so as to enable the bidder to make an informed bid. Failure to do so shall not relieve the successful bidder of its obligation to furnish all materials, products, and/or labor necessary to complete the provision of the awarded contract, and failure to do so may result in the claims against bonds. No allowance will be made for any claims that a bid and/or response were based on incomplete information as to the nature and character of the sites and of the work involved.

Plans and Specifications are open to inspection the Florence County Vendor Registration System. There is no cost for downloading Plans and Specifications.

In order to be considered, all bids must be received by the Florence County Procurement Office, Florence County Complex, 180 N. Irby Street - MSC-R, Rm. B-5, Florence, SC 29501-3431 later than Tuesday, June 1, 2021 at 2:00 p.m. (EST). PLEASE CONTACT FLORENCE COUNTY PROCUREMENT OFFICE AT 843-665-3018 or email [pletcher@florenceco.org](mailto:pletcher@florenceco.org). IF YOU INTEND TO HAND DELIVER YOUR BID SUBMITTAL TO ARRANGE FOR SOMEONE TO BE AVAILABLE TO ACCEPT YOUR BID.

The sealed bids will then be opened and read aloud in room B-5 of the County Complex at 2:05 p.m. (ET) June 1, 2021. The bid opening will be streamed live on ZOOM via link.

<https://us04web.zoom.us/j/5444511250?pwd=MChPRmtKcmFDM2thVVQwMWNMUVJQQT09>

Meeting ID: 544 451 1250  
Passcode: 997329

A non-mandatory PRE-BID meeting will be conducted on May 10, 2021 at 10:00am. The PRE-BID bid opening will be streamed live on ZOOM via link.

<https://zoom.us/j/3188071729?pwd=SjhpRXhaWkRQK2p3cmZOYlhFZ0Rmdz09>

Meeting ID: 318 807 1729  
Passcode: PIONEER1

Deadline for questions is May 24, 2021, at 5:00 PM. All questions pertaining to this solicitation shall be directed to Patrick Fletcher, by email at [pletcher@florenceco.org](mailto:pletcher@florenceco.org).

Bids must be clearly marked, "BID NO. 22-20/21". Contractors mailing bids should allow delivery time to ensure timely receipt of their bid. The responsibility for getting the bid to Florence County on or before the specified time and date is solely and strictly the responsibility of the proposing firm. Any bids received later than the submission deadline will not be accepted/considered. Electronic bids will not be accepted. Directions may be obtained by calling (843) 665-3018. Florence County will in no way be responsible for delays caused by any occurrence.

Florence County under Title VI of the Civil Rights Act of 1964 and related statutes ensures that no person shall on the grounds of race, color, national origin, sex, disability, and age, be excluded

from participation in, be denied the benefits of, or be otherwise subjected to discrimination under any program or activity it administers.

Minority Business Owners (minority or woman owned businesses) will be afforded full opportunity to submit bids in response to this invitation and will not be discriminated against on the grounds of race, color, creed, sex or national origin in consideration for an award. It is the policy of the County that minority business and women owned business enterprises (MBE/WBE) have an opportunity to participate at all levels of contracting in the performance of County projects to the extent practical and consistent with the efficient performance of the contract.

In accordance with the requirements of the Title II of the Americans with Disabilities Act of 1990 ("ADA"), the County of Florence, South Carolina will not discriminate against qualified individuals with disabilities on the basis of disability in its services, programs or activities.

This request for bids does not commit Florence County to award a contract; to pay any cost incurred in the preparation of a bid; or, to procure or contract for the services. Florence County reserves the right to accept or reject any or all bids received as a result of this request; to negotiate with any or all qualified proposers; or, to cancel in part or in its entirety this bid invitation, if it is in the best interest of the County to do so.

### **SPECIFICATIONS/SCOPE OF WORK**

The project consists of the following generally described work:

Improvements to approximately 18-acre parcel within the Florence County Industrial Park East, Florence County, South Carolina. The development will include an approximately 100,200 SF mass graded pad and site improvements, ±635 linear feet of asphalt paved roadway, and asphalt paved dedicated right-turn lane, including gravel turnaround, with center concrete curb and gutter island, clearing and grubbing; grading; erosion control; ditched storm drainage system with RCP culverts with wet stormwater detention pond; ±80 of 12" DIP water line extension, ±810 linear of 12" PVC - C900 - DR 18 water line extension, jack & bore ±45 linear feet of 20" steel casing; ±3,734 linear feet of 12" PVC - SDR 26 sewer service line.

### **MINIMUM MANDATORY REQUIREMENTS**

The following minimum mandatory requirements shall be met and documented:

1. In business for at least the past five (5) years under the current business name without declaring bankruptcy. A letter on company letterhead declaring that the company has been in business for five (5) years + and has not declared bankruptcy can be included with the bid form in lieu of a bid bond. (Include with bid).
2. A minimum of four (4) similar project references with contact names and contact information (including a current e-mail address) that are past customers within the last three (3) years. Provide a brief project description, project budget, start and completion dates, and contact information. (Include with bid).
3. Copy of Worker's Compensation and General Liability Insurance with Florence listed as additional insured supplied to the Procurement Office prior to contract execution or commencement of any work. (Must be provided prior to execution of a contract).
4. The successful vendor must be able to meet all Federal, State, and local regulations required for this project. To be acceptable to the Owner, bidders must be skilled and/or licensed, if applicable, in the class of work on which they respond, and no bid will be

considered from any bidder who is unable to show that he has actually performed considerable work of similar character to that on which he is bidding.

**END OF INVITATION TO BID**

**REFERENCE ONLY**

**DOCUMENT 00110****INSTRUCTIONS TO BIDDERS**

## 1) TAXES:

- a) Florence County pays SC Sales Taxes in the amount of 8%. **INCLUDE SC SALES TAX WITH YOUR BID.**

## 2) NON-RESIDENT TAXPAYER REGISTRATION AFFIDAVIT Nonresident proposers receiving income from business conducted in South Carolina are required to pay taxes to the state on that income. To facilitate this requirement, a nonresident proposer must register with the South Carolina Secretary of State or the South Carolina Department of Revenue. In compliance with South Carolina Code Section 12-8-540 and 12-8-550, a proposer located outside of South Carolina that receives a contract from the County, must furnish Form 1-312 (Rev.10/5/07), Nonresident Taxpayer Registration Affidavit Income Tax Withholding, properly executed and signed.

- a) If your firm is not presently registered with the appropriate state office, you may indicate the intent to do so should your firm be awarded a contract. Questions concerning this form may be directed to the South Carolina Department of Revenue.

## 3) EMPLOYEE VERIFICATION PER THE SOUTH CAROLINA ILLEGAL IMMIGRATION REFORM ACT By entering into this Agreement, the Design Team hereby certifies to County that it will verify the employment status of any new employees and require any consultants or sub-consultants performing services hereunder to verify any new employees' status, per the terms of the South Carolina Illegal Immigration Reform Act, and as set out in Title 41, Chapter 8 of the Code of Laws of South Carolina, 1976.

## 4) RECEIPT AND OPENING OF SEALED BIDS:

a) Sealed bids will be received and opened as specified in this Invitation-To-Bid document.

- b) The Owner will consider as non-responsive any bid not prepared and submitted in accordance with the provisions hereof and may waive any informality or reject any and all bids. Any bid may be withdrawn prior to the above scheduled time for the opening of bids or authorized postponement thereof. Any bid received after the time and date specified shall not be considered. No bidder may withdraw a bid within 120 calendar days after the actual date of the opening thereof or as provided for the in the bid documents whichever is later.

## 5) PREPARATION OF BID:

- a) All bids will be evaluated in accordance with procedures and specifications contained herein and Florence County Code. The responsiveness to same determined in accordance to the instructions and criteria in this document. Any bid not providing sufficient information and documentation to comply with the Invitation-To-Bid Evaluation requirements will be considered non-responsive and removed from further consideration.
- b) A bid shall be made in the official name of the firm or individual under which business is conducted (showing the official business address) and must be signed in ink by a

person duly authorized to legally bind the person, partnership, company, or corporation submitting the bid.

- c) All information requested of the bidder shall be entered in the appropriate spaces on the provided forms. If additional space is required, attach additional pages as needed within the sealed bid response.
- d) Bidders mailing their bid must allow a sufficient mail delivery period to insure timely receipt of their bid. Florence County is not responsible for bids delayed by mail and/or delivery services of any nature. It is the bidder's sole responsibility to ensure that all documents are received by person (or office) at the time indicated in the bid document. No facsimile or email submissions.
- e) Bidders must clearly mark as "Confidential" each part of their offer which they consider to be proprietary information that could be exempt from disclosure under Section 30-4-40, Code of Laws of South Carolina, 1976 as amended (Freedom of Information Act). If any part is designated as "confidential", there must be attached to that part an explanation of how this information fits within one or more categories listed in Section 30-4-40. Florence County reserves the right to determine whether this information should be exempt from disclosure and no legal action may be brought against Florence County or his agents for its determination in this regard.
- f) All information shall be entered in ink or typewritten.
- g) All proposed costs shall be for all licenses, permits, taxes, labor, material, transportation, equipment and any other components/services that are required to complete the work embraced herein this Invitation-To-Bid document.
- h) If applicable, each bidder shall show the names, address and license number of any subcontractors and the scope of their work, which he may employ on the Project. Subcontractors will be required to comply with all applicable requirements of the Specifications. If applicable, each bid shall include the bidder's name, address and South Carolina Contractor's License Number. In South Carolina, where a contract amounts to \$17,500 or more, the name and license number of the subcontractor, where bid is issued, shall also be shown. The license numbers shall be shown on the bid form bid which will be enclosed in the sealed bid.
- i) Each bid must be submitted in a sealed envelope, addressed to the Owner along with the name of the project for which the bid is submitted. The bidder shall also show his name and address, on the outside of the envelope. Failure to show the required information may result in rejection of the response and removal from further consideration. If forwarded by mail or carrier, the sealed envelope containing the bid must be enclosed in another outer envelope. Florence County shall not be responsible for unidentified bids.
- j) Each bidder must be registered with Vendor Registry to receive all addendums in conjunction with this project via e-mail. It shall be each bidder's responsibility to assure that all addenda have been received. No claim for failure to receive addenda will be considered. All addendums issued in accordance with this bid request can also be obtained from the Florence County Procurement Office located at the County Complex, 180 N. Irby Street; Room B-5, Florence, SC 29501, by e-mailing [pfletcher@florenceco.org](mailto:pfletcher@florenceco.org).

- k) No binding interpretation of the meaning of the documents or any questions relating to the bid will be made to any bidder orally prior to the receipt of bids. Any request for such interpretation or questions shall be made in writing via e-mail the Florence County Procurement Director (pfletcher@florenceco.org) or his designee. To be given consideration, such requests must be received by 5:00 p.m. August 19, 2020. Any such interpretations or supplemental instructions will be issued in the form of addendum(s) which will be posted via Vendor Registry or emailed to persons receiving a set of bid documents, not later than three days prior to the date for opening of bids. Failure of any bidder to receive such addendum(s) shall not relieve the successful bidder of any obligation under the awarded contract and this Document.
- 6) **BIDDER QUALIFICATIONS:**
- a) To be acceptable to the Owner, bidders must be skilled and/or licensed, if applicable, in the class of work on which they respond, and no bid will be considered from any bidder who is unable to show that he has actually performed considerable work of similar character to that on which he is bidding.
- 7) **BID BOND (SURETY) REQUIREMENTS:**
- a) As discussed in the Bid Surety Requirement document contained herein, Bid Surety must accompany any and all responses submitted that contain estimated project costs exceeding thirty thousand dollars (\$150,000.00) Failure to satisfy this Bid Surety requirement will result in your bid being considered non-responsive and removed from further consideration for award of the subject contract. Bid Surety can be provided as discussed below.
- b) Bid Surety will not be required from Contractors that have been in business for five (5) consecutive years without filing for bankruptcy. A statement on the company's letterhead from the firm stating this qualification will replace the bid bond and must accompany the bid.
- c) For all bidders not meeting the criteria of "b" above, a deposit in the amount of five percent (5%) of the proposed total contract price shall accompany the bid. These deposits shall take the form of certified check, cashier's check or bond executed by a corporate surety licensed under the laws of this state. The cashier's check or certified check shall be deposited to the County's account if the successful bidder fails to enter into the proposed contract within ten (10) days after the award. Bid deposits of unsuccessful bidders will be returned as soon as the contract is awarded.
- d) **One of the above requirements must be met for your response to be considered.**
- 8) **EXECUTION OF CONTRACT:**
- a) The bidder to whom an award is made shall deliver to the County a certificate of insurance as discussed in **Item 10 below**. The County's issuance of a purchase order and/or verbal notification of such execution may serve as the official "Notice to Proceed". Bidders failing to enter the proposed contract may be subject to Debarment and Suspension, as prescribed under Section 11-102 of the Florence County Code, from future consideration for award of contracts. Bidders failing to enter the proposed contract may result in claims against bonds.
- 9) **LIQUIDATED DAMAGES FOR FAILURE TO ENTER INTO CONTRACT:**
- a) The successful bidder, upon his failure or refusal to execute and deliver the contract required within twenty-one (21) calendar days after he has received "Notice of Award", shall forfeit to the Owner, as liquidated damages for such failure or refusal, the security

deposited with his bid. Forfeiture of guaranty under this section may result in the bidder being subjected to Debarment or Suspension, as prescribed under Section 11-102 of the Florence County Code, from future consideration for award of contracts.

10) TERM OF CONTRACT AND CONTRACT DOCUMENTS:

- a) The contract documents that will form the contract shall include:
- The Complete Bid Document
  - All Addenda
  - The Successful Bidder's Submitted Bid Document
  - Notice of Award (Verbal or Written)
  - Purchase Order/Agreement/Contract
  - Insurance Certification

11) ORDER OF PRECEDENCE

- a) In the event of inconsistent or conflicting provision of this contract and referenced documents, the following descending order of precedence shall prevail: (1) Florence County Procurement Ordinance, as amended (2) Bid Announcement/Advertisement (3) Special Terms and Conditions, (4) Instructions to Responders and Vendor Agreements (5) Other provisions of the contract whether incorporated by reference or otherwise, and (6) the Specifications.

12) INSURANCE AND BONDS:

- a) Upon award of the contract or Purchase Order, the bidder shall maintain, throughout the performance of its obligations a policy of Worker's Compensation insurance with such limits as may be required by SC law, and a policy or policies of general liability insurance insuring against liability for injury to, and death of, persons and damage to, destruction of, property arising out of, or based upon, any act or omission of the bidder or any of its subcontractors of their respective officers, directors employees or agents. Such liability insurance shall have limits sufficient to cover any loss or potential loss resulting from this contract. Florence County must be listed as additional insured. The certificate must allow a minimum of a 30-day written notice of cancellation. Bidder shall provide a Certificate of Insurance to the Florence County Procurement offices prior to start of work.

13) EXAMINATION OF PROJECT'S WORK SITES:

- a) Each of the bidders shall fully familiarize itself with the conditions relating to the bid to ensure complete understanding of all the details involved. The bidder shall satisfy itself as to the actual requirements of the bid by personal examination of its location or other means, so as to enable the bidder to make an informed bid. Failure to do so shall not relieve the successful bidder of its obligation to furnish all materials, products, and/or labor necessary to complete the provision of the awarded contract and failure to do so may result in the claims against bonds. No allowance will be made for any claims that a bid and/or response was based on incomplete information as to the nature and character of the sites and of the work involved.

14) INTERPRETATIONS OF PLANS AND SPECIFICATIONS:

- a) No binding interpretation of the meaning of the documents or any questions relating to the bid will be made to any bidder orally prior to the receipt of bids. Any request for such interpretation or questions shall be made in writing via e-mail the Florence County Procurement Director ([pfletcher@florenceco.org](mailto:pfletcher@florenceco.org)) or his designee. To be given consideration, such requests must be received as stated in the invitation to bid. Any such interpretations or supplemental instructions will be issued in the form of addendum(s) to the Contract Documents which will be mailed or emailed to persons receiving a set of documents, not later than three days prior to the date for opening of bids. Failure of any

bidder to receive such addendum(s) shall not relieve the successful bidder of any obligation under the awarded contract and this Document.

15) RIGHT TO INCREASE OR DECREASE THE AMOUNT OF WORK:

- a) The Owner reserves the right to increase or decrease the amount of work under the Contract at the unit prices quoted in the bid received from the successful bidder.

16) POWER OF ATTORNEY:

- a) Attorneys-in-fact who sign bid bonds or contract bonds must file with each bond a certified and effectively dated copy of their power-of-attorney

17) LAW AND REGULATIONS:

- a) The bidder's attention is directed to the fact that all applicable Federal, State (including SCDHEC), and Local laws, statutes, ordinances, and the rules and regulations of all authorities having jurisdiction over the project shall apply to the contract and the project throughout, and they will be deemed to be included in the contract the same as though herein written out in full.
- b) The bidder's attention is directed to the fact that all bids will comply as prescribed under the most current Florence County Code.

18) FEDERAL PARTICIPATION DISCLOSURE:

- a) This project will be partially funded with Federal funds from the United States Department of Commerce, Economic Development Association and therefore is subject to the Federal laws and regulations associated with that program.

19) METHOD OF AWARD:

- a) Contracts will be awarded to the to the lowest responsive and responsible bidder.

- b) Florence County reserves the right to accept or reject, in whole, in part, together or separately, any and all responses as appears in its judgment to be in the best interests of the County, or to waive any and all technicalities and informalities in determining the action of each bid.

20) OBLIGATION OF BIDDER:

- a) At the time of the opening of bids, each bidder will be presumed to have inspected the site, if applicable, and to have read and to be thoroughly familiar with the Documents (including all addenda). The failure or omission of any bidder to examine any form, instruction or document shall in no way relieve any bidder from any obligation in respect to this Invitation-To-Bid.

**DOCUMENT 00313****BID FORM**

**PROJECT IDENTIFICATION: Bid No. 22-20/21 Phase I Improvements Florence  
County Industrial Park East**

**CONTRACT IDENTIFICATION AND NUMBER: J-28601.0001**

**THIS BID IS SUBMITTED TO: Florence County**

1. The undersigned BIDDER proposes and agrees, if this Bid is accepted, to enter into an agreement with OWNER in the form included in the Contract Documents to perform and furnish all Work as specified or indicated in the Contract Documents for the Bid Price and within the Bid Times indicated in this Bid and in accordance with the other terms and conditions of the Contract Documents.
2. BIDDER accepts all of the terms and conditions of the Advertisement or Invitation to Bid and Instructions to Bidders, including without limitation those dealing with the disposition of Bid security. This Bid will remain subject to acceptance for 120-days after the day of Bid opening, or for such longer period of time BIDDER may agree to in writing upon request of OWNER.
3. In submitting this Bid, BIDDER represents, as more fully set forth in the Agreement, that:
  - a. BIDDER has examined and carefully studied the Plans and Specifications for the work and contractual documents relative thereto, and has read all Technical Provisions, Supplementary Conditions, and General Conditions, furnished prior to the opening of Bids and can fulfill the requirements of the work to be performed.

REFERENCE ONLY

- b. BIDDER further acknowledges hereby receipt of the following Addenda:

ADDENDUM NO.	DATE

- c. BIDDER has visited the site and become familiar with and is satisfied as to the general, local and site conditions possibly affecting cost, progress, performance and furnishing of the Work;
    - d. BIDDER is familiar with and is satisfied as to all federal, state, and local Laws and Regulations possibly affecting cost, progress, performance and furnishing of the Work.

- e. BIDDER has carefully studied all reports of explorations and tests of subsurface conditions at or contiguous to the site and all drawings of physical conditions in or relating to existing surface or subsurface structure at or contiguous to the site (except underground Facilities) have been identified in the Supplementary Conditions. BIDDER acknowledges such reports and drawings are not Contract Documents and may not be complete for BIDDER's purposes. BIDDER acknowledges OWNER and Engineer do not assume responsibility for the accuracy or completeness of information and data shown or indicated in the Bidding Documents with respect to Underground Facilities at or contiguous to the site. BIDDER has obtained and carefully studied (or assumes responsibility for having done so) all such additional or supplementary examinations, investigations, explorations, tests, studies and data concerning conditions (surface, subsurface and Underground Facilities) at or contiguous to the site or otherwise which may affect cost progress, performance or furnishing of the work or which relate to any aspect of the means, methods, techniques, sequences and procedures of construction to be employed by BIDDER and safety precautions and programs incident thereto. BIDDER does not consider any additional examinations, investigations, explorations, tests, studies, or data are necessary for the determination of this Bid for performance and furnishing of the Work in accordance with the times, price and other terms and conditions of the Bidding Documents.
  - f. BIDDER is aware of the general nature of Work to be performed by Owner and others at the site relating to Work for which this Bid is submitted as indicated in the Bidding Documents.
  - g. BIDDER has correlated the information known to BIDDER, information and observations obtained from visits to the site, reports and drawings identified in the Bidding Documents and all additional examinations, investigations, explorations, tests, studies, and data with the Bidding Documents.
  - h. BIDDER has given ENGINEER written notice of all conflicts, errors, ambiguities, or discrepancies BIDDER has discovered in the Bidding Documents and the written resolution thereof by ENGINEER is acceptable to BIDDER. The Bidding Documents are generally sufficient to indicate and convey understanding of all terms and conditions for performing and furnishing the Work for which this Bid is submitted.
  - i. This bid is genuine and not made in the interest of or on behalf of any undisclosed person, firm or corporation and is not submitted in conformity with any agreement or rules of any group, association, organization or corporation; BIDDER has not directly or indirectly induced or solicited any other Bidder to submit a false or sham Bid; BIDDER has not solicited or induced any person, firm or corporation to refrain from bidding; and BIDDER has not sought by collusion to obtain for itself any advantage over any other Bidder or over OWNER.
4. BIDDER will complete the Work in accordance with the Contract Documents for the following price(s):

**BID PROPOSAL**

ITEM	DESCRIPTION	QUANTITY		COST	
		# OF UNITS	UNIT MEASURE	PER UNIT	TOTAL COST
<b>ROADWAY IMPROVEMENTS/LANDSCAPING</b>					
1	Construction Staking	1	LS		
2	Construction Entrance	1	EA		
3	Clearing & Grubbing	4	AC		
4	Earthwork (Cut/Fill)	1	LS		
5	Mill Existing Asphalt for Full-Depth Asphalt Tie-In	660	SY		
6	2" HMA Surface Course SCDOT Spec. Type B	4,535	SY		
7	2" HMA Intermediate Course SCDOT Spec. Type B	4,535	SY		
8	10" Graded Aggregate Base Course SCDOT Spec Section 159	4,360	SY		
9	8" Graded Aggregate Base Course Per SCDOT, With Non-Woven Geotextile Fabric	1,495	SY		
10	18" Standard Concrete Curb & Gutter	836	LF		
11	18" Pitched Concrete Curb & Gutter	560	LF		
12	SCDOT Type 16 Inlet	2	EA		
13	Grate Inlet	1	EA		
14	Concrete Flume	2	EA		
15	15" Reinforced Concrete Pipe (Class III)	185	LF		
16	18" Reinforced Concrete Pipe (Class III)	116	LF		
17	24" Reinforced Concrete Pipe (Class III)	262	LF		
18	15" Beveled End Sections	1	EA		
19	18" Beveled End Section	2	EA		
20	24" Beveled End Section	2	EA		
21	Rip Rap with Filter Fabric	88	SY		
22	Concrete Washout	1	EA		
23	Silt Fence – Single Row	295	LF		
24	Rock Check Dams	4	EA		
25	Install Earthen Flow Control Structures	1	LS		

26	Type "A" Inlet Protection	4	EA		
27	Type "E" Inlet Protection	2	EA		
28	Pavement Marking, Striping & Signage	1	LS		
29	Traffic Control	1	LS		
30	Grassing (Temporary & Permanent)	2	AC		
31	Sarah's Favorite Crepe Myrtle	10	EA		
32	Nuttall Oak	4	EA		
33	Upperton Willow Oak	2	EA		
34	Shumard Oak	23	EA		
35	Dwarf Schillings Holly	59	EA		
36	Sunshine Ligustrum	81	EA		
37	Carolina Moonlight Loropetalum	65	EA		
38	Blue Globe African Lily	103	EA		
39	Tifsport Bermudagrass Sod	65,000	SF		
40	Parson's Juniper	94	EA		
41	Super Blue Liriope	15	EA		
42	Pink Muhly Grass	31	EA		
43	Walker's Low Catmint	67	EA		
44	Irrigation	1	LS		
<b>WATER</b>					
45	Construction Staking	1	LS		
46	Tie to Existing Waterline With 8"x8" Tapping Sleeve	1	EA		
47	Install 4" Conduit for Future Lighting & Irrigation	290	LF		
48	12"x1.50" Tapping Saddle	1	EA		
49	1.50" Water Meter & Backflow Preventer, Including Vaults, Hatches, & All Appurtenances for a Complete Installation	1	EA		
50	1.50" Cap	1	EA		
51	1.50" Sch 40 PVC Waterline	136	LF		
52	Concrete Valve Marker	5	EA		
53	8" Gate Valve	2	EA		
54	8" Cap	1	EA		
55	12" Gate Valve	3	EA		
56	12"x8" Reducer	1	EA		
57	12"x8" Tee	1	EA		

58	12" DIP	62	LF		
59	Jack & Bore 24" Steel Casing	45	LF		
60	12" 45° Bend	4	EA		
61	12" 22.50° Bend	2	EA		
62	12" Cap	1	EA		
63	Fire Hydrant Assembly, Tee, & Gate Valve	2	EA		
64	8" PVC C900 – DR 18 Waterline	84	LF		
65	12" PVC C900 – DR 18 Waterline	644	LF		
66	Testing	1	LS		
67	Grassing (Temporary & Permanent)	0.50	AC		
<b>SANITARY SEWER</b>					
68	Clearing & Grubbing	2.50	AC		
69	Construction Staking	1	LS		
70	Silt Fence – Single Row	2,650	LF		
71	Silt Fence – Double Row	55	LF		
72	Sawcut & Remove Existing Pavement as Necessary	1	LS		
73	Remove Existing Monitoring Wells	3	EA		
74	Tie to Existing Manhole	1	EA		
75	Sewer Manhole	13	EA		
76	Guided Auger Bore 30" Steel Casing	205	LF		
77	12" DIP	250	LF		
78	12" PVC – SDR 26 Gravity Sewer	3,596	LF		
79	6" PVC – SDR 26 Gravity Sewer	100	LF		
80	Cleanout	1	EA		
81	Testing	1	LS		
82	Grassing (Temporary & Permanent)	2.50	AC		
<b>MASS GRADING</b>					
83	Clearing & Grubbing	12	AC		
84	Construction Staking	1	LS		
85	Silt Fence – Single Row	625	LF		
86	Silt Fence – Double Row	770	LF		
87	Rock Check Dams	6	EA		
88	Sediment Tubes	2	EA		
89	Rip Rap with Filter Fabric	20	SY		

90	Diversion Berm	620	LF		
91	2 – 18" RCP Class III Outlet Pipe	27	LF		
92	2 – 18" RCP Class V	14	LF		
93	18" Beveled End Section	6	EA		
94	Skimmer, Cleanout Stake, Forebay Berm, Turbidity Curtain & Emergency Spillway for Stormwater Pond	1	LS		
95	Erosion Control Blanket	4,150	SY		
96	Earthwork (Cut/Fill)	1	LS		
97	Grassing (Temporary & Permanent)	12	AC		
<b><u>Total Project:</u></b>					

TOTAL BID FOR ALL ESTIMATED PRICES \_\_\_\_\_  
(Use words)

\_\_\_\_\_ (\$ \_\_\_\_\_)  
(Figures)

Unit Prices have been computed in accordance with paragraph 11.03.C of the General Conditions.

**REFERENCE ONLY**

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

<b>FLORENCE COUNTY, SOUTH CAROLINA,</b> a Body Politic and Corporate and a Political Subdivision of the State of SC	MAIL TO: Florence County Procurement 180 N. Irby Street County Complex MSC-R Florence, SC 29501	
<b>SEALED BID # 22-20/21</b> Phase I Improvements Florence County Industrial Park East - J-28601.0001	HAND CARRY TO: Procurement Office, Room B-5 County Complex, 180 N. Irby Street Florence, South Carolina 29501 TELEPHONE NO. (843) 665-3018	
<b>Bids will be received at the Procurement          Office at 180 N. Irby Street,          Rm. B-5 until June 1, 2021 at 2:00 p.m. (EST).</b>	<b>NOTE:  <u>BID FORM MUST USE AND SUBMIT WITH THIS BID          SHEET THE UNIT BID SHEET BREAKDOWN          SPREADSHEET.</u></b>	
<b>Then Publicly Opened via Zoom Meeting,          June 1, 2021 at 2:05 p.m. (EST).</b>	<b>NOTE:  <u>SUBMIT PROJECT REFERENCE WITH YOUR BID!</u></b>	

LEGAL COMPANY NAME: \_\_\_\_\_

D/B/A IF APPLICABLE: \_\_\_\_\_

MAILING ADDRESS: \_\_\_\_\_

PHYSICAL ADDRESS: \_\_\_\_\_

CITY-STATE-ZIP: \_\_\_\_\_

TELEPHONE NO: \_\_\_\_\_ FAX NO: \_\_\_\_\_

FEDERAL ID (TAX ID) NO: \_\_\_\_\_ E-MAIL: \_\_\_\_\_

AUTHORIZED SIGNATURE : \_\_\_\_\_

PRINTED NAME: \_\_\_\_\_

SC CONTRACTOR'S LICENSE # \_\_\_\_\_

Total cost, including all taxes and expenses needed for the Bid for Bid No. 22-20/21 Phase I Improvements Florence County Industrial Park East, located in Florence County.

**TOTAL BASE BID PRICE:** \$ \_\_\_\_\_

**Total Bid Amount in Words -**

\_\_\_\_\_

---

**The contractor has 240 calendar days from the date of the Notice to Proceed letter to complete the project.**

The Bidder declares their Bid Response is made without any connection with any other individual that may be submitting a Bid Response to this IFB and their Bid Response, in all respects, is fair and in good faith, without collusion or fraud, with another Bidder, representative or agent.

By submission of a response to this Invitation for Bid, the bidder agrees and certifies, to deliver all required services and perform all required work with the strictest conformance to meet or exceed the Scope of Work, specifications and minimum requirements contained within this Invitation to Bid.

All pricing is firm and will remain firm for at least one hundred twenty (120) calendar days from the time and date of the IFB submittal and opening. During this period, the Bidder may only withdraw their Bid Response by submitting a written request to Florence County and Florence County approving said written request.

The bidder agrees to abide by all conditions of this bid and verifies that he is authorized to sign this bid for the offerer. The bidder further states that the company affiliated with this bid currently complies with all applicable federal and state laws and directives relative to non-discriminatory practices in employment.

The Bidder, in compliance with the Invitation-To-Bid, and having examined the Project Documents, and being familiar with all of the conditions surrounding the proposed project, including the availability of materials, labor, and work site environmental conditions, hereby proposes to furnish all permits, labor, materials, supplies, and equipment and to perform the duties in accordance with the contract documents of which this Bid Form is a part.

The Bidder declares that he has read, understands, and accepts the Vendor Agreements and Instructions to Responders which are part of the bid documents.

The Bidder further proposes and agrees, if this Bid is accepted, to contract with Florence County, to furnish all permits, materials, equipment, tools, apparatus, means of transportation, and labor necessary hereto, and to complete the proposed project in full and complete accordance with the Project Documents, to the full and entire

satisfaction of the Owner, at the prices listed in the Bid Schedule. The amounts listed on the Bid Schedule section of this Bid Form also include all costs associated with the compliance of all applicable State laws, local ordinances, and the rules and regulations of all authorities and professional association standards having jurisdiction over the project or the materials used throughout, and they will be deemed to be included in the contract the same as though herein written out in full. Unit prices and/or lump sums are shown in the Bid Schedule section below. In case of error in extension, the Unit Price shall govern rather than the Amount. Where Lump Sum Amounts are bid, the amount for each bid item shall govern rather than the total of any several items.

**REFERENCE ONLY**

DOCUMENT 00411

BID BOND

**BIDDER** (Name and Address):

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

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

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

**OWNER** (Name and Address):

**Florence County  
180 North Irby Street  
Florence, SC 29501**

**BID**

BID DUE DATE: September 2, 2020 at 10:00 a.m.

PROJECT (Brief Description Including Location):

**Invitation to Bid for Bid No. 22-20/21 Phase I Improvements Florence County Industrial Park East**

**BOND**

**REFERENCE ONLY**

BOND NUMBER: \_\_\_\_\_ DATE: \_\_\_\_\_  
(Not later than Bid Due Date)

PENAL SUM: \_\_\_\_\_  
(5% of Bid Sum)

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

**BIDDER**

**SURETY**

\_\_\_\_\_  
(Seal)  
Bidder's Name and Corporate Seal

\_\_\_\_\_  
(Seal)  
Surety's Name and Corporate Seal

By: \_\_\_\_\_  
Signature and Title

By: \_\_\_\_\_  
Signature and Title  
(Attach Power of Attorney)

Attest: \_\_\_\_\_  
Signature and Title

Attest: \_\_\_\_\_  
Signature and Title

- Note: (1) Above addresses are to be used for giving required notice.
- (2) Any singular reference to Bidder, Surety, Owner, or other party shall be considered plural where applicable.

**PENAL SUM FORM**

1. Bidder and Surety, jointly and severally, bind themselves, their heirs, executors, administrators, successors and assigns to pay to Owner upon default of Bidder the penal sum set forth on the face of this Bond.
2. Default of Bidder shall occur upon the failure of Bidder to deliver within the time required by the Bidding Documents the executed Agreement required by the Bidding Documents and any performance and payment bonds required by the Bidding Documents and Contract Documents.
3. This obligation shall be null and void if:
  - 3.1 Owner accepts Bidder's bid and Bidder delivers within the time required by the Bidding Documents (or any extension thereof agreed to in writing by Owner) the executed Agreement required by the Bidding Documents and any performance and payment bonds required by the Bidding Documents and Contract Document, or
  - 3.2 All bids are rejected by Owner, or
  - 3.3 Owner fails to issue a notice of award to Bidder within the time specified in the Bidding Documents (or any extension thereof agreed to in writing by Bidder and, if applicable, consented to by Surety when required by paragraph 5 hereof.)
4. Payment under this Bond will be due and payable upon default of Bidder and within 30 calendar days after receipt by Bidder and Surety of written notice of default from Owner, which notice will be given with reasonable promptness, identifying this Bond and the Project and including a statement of the amount due.
5. Surety waives notice of and any and all defenses based on arising out of any time extension to issue notice of award agreed to in writing by Owner and Bidder, provided that the time for issuing notice of award including extensions shall not in the aggregate exceed 120 days from Bid Due Date without Surety's written consent.
6. No suit or action shall be commenced under this Bond prior to 30 calendar days after the notice of default required in paragraph 4 above is received by Bidder and Surety, and in no case later than one year after Bid Due Date.
7. Any suit or action under this Bond shall be commenced only in a court of competent jurisdiction located in the state in which the Project is located.
8. Notice required hereunder shall be in writing and sent to Bidder and Surety at their respective addresses shown on the face of this Bond. Such notices may be sent by personal delivery, commercial courier or by United States Registered or Certified Mail, return receipt requested, postage pre-paid, and shall be deemed to be effective upon receipt by the party concerned.
9. Surety shall cause to be attached to this Bond a current and effective Power of Attorney evidencing the authority of the officer, agent or representative who executed this Bond on behalf of Surety to execute, seal and deliver such Bond and bind the Surety thereby.
10. This Bond is intended to conform to all applicable statutory requirements. Any applicable requirement of any applicable statute that has been omitted from this Bond shall be deemed to be included herein as if set forth at length. If any provision of the Bond conflicts with any applicable provision of any applicable statute, then the provision of said statute shall govern and the remainder of this Bond that is not in conflict therewith shall continue in full force and effect.
11. The term "bid" as used herein includes a bid, offer or proposal as applicable.

**DOCUMENT 00506****STANDARD FORM OF AGREEMENT  
BETWEEN OWNER AND CONTRACTOR**

**THIS AGREEMENT** is dated as of the \_\_\_\_\_ day of \_\_\_\_\_ in the year 2021 by and between Florence County (hereinafter called OWNER) and \_\_\_\_\_ (hereinafter called CONTRACTOR).

OWNER and CONTRACTOR, in consideration of the mutual covenants hereinafter set forth, agree as follows:

**ARTICLE 1 WORK**

CONTRACTOR shall complete all Work as specified or indicated in the Contract Documents. The Work is generally described as follows:

Improvements to approximately 18-acre parcel within the Florence County Industrial Park East, Florence County, South Carolina. The development will include an approximately 100,200 SF mass graded pad and site improvements, ±635 linear feet of asphalt paved roadway, and asphalt paved dedicated right-turn lane, including gravel turnaround, with center concrete curb and gutter island, clearing and grubbing; grading; erosion control; ditched storm drainage system with RCP culverts with wet stormwater detention pond; ±80 of 12" DIP water line extension, ±810 linear of 12" PVC - C900 - DR 18 water line extension, jack & bore ±45 linear feet of 20" steel casing; ±3,734 linear feet of 12" PVC – SDR 26 sewer service line.

**ARTICLE 2 ENGINEER**

The Project has been designed by Thomas & Hutton Engineering Co. who is hereinafter called ENGINEER and who is to act as OWNER's representative, assume all duties and responsibilities and have the rights and authority assigned to ENGINEER in the Contract Documents in connection with the completion of the Work in accordance with the Contract Documents.

**ARTICLE 3 CONTRACT TIMES**

All time limits for Substantial Completion and completion and readiness for final payment as stated in the Contract Documents are of essence to the Contract.

- 3.1 The Work will be substantially completed within 210-days after the date when the Contract Times commence to run as provided in paragraph 2.03 of the General Conditions and completed and ready for final payment in accordance with paragraph 14.07 of the General Conditions within 240-days after the date when the Contract Times commence to run. Included in the contract times are 28-days for rain delay. Time delays due to excess rain shall be reported by the Contractor to the Engineer in writing, within 30 days of each event.
- 3.2 *Liquidated Damages.* OWNER and CONTRACTOR recognize time is of the essence for this Agreement and OWNER will suffer financial loss if the Work is not completed within the times specified in paragraph 3.1 above, plus any extensions thereof allowed in accordance with Article 12 of the General Conditions. The parties also recognize the delays, expense, and difficulties involved in proving the



5.1.1.1 Prior to Substantial Completion, progress payments will be made in an amount equal to the percentage indicated below, but, in each case, less the aggregate of payments previously made and less such amounts as ENGINEER shall determine, or OWNER may withhold, in accordance with paragraph 14.02 of the General Conditions.

**90%** of the Work completed (with the balance being retainage). If Work has been 50% completed as determined by ENGINEER, and if the character and progress of the Work have been satisfactory to OWNER and ENGINEER, OWNER, on recommendation of ENGINEER, may determine as long as the character and progress of the Work remain satisfactory to them, there will be no additional retainage on account of Work completed, in which case the remaining progress payments prior to Substantial Completion will be in an amount equal to 100% of the Work completed.

**90%** of Cost of the Work (with the balance being retainage) applicable to materials and equipment not incorporated in the Work (but delivered, suitably stored and accompanied by documentation satisfactory to OWNER as provided in paragraph 14.02.A.1 of the General Conditions).

5.1.1.2 Upon Substantial Completion, in an amount sufficient to increase the total payments to CONTRACTOR to **95%** of the Cost of the Work, (with the balance being retainage), less such amounts as ENGINEER shall determine, or OWNER may withhold, in accordance with paragraph 14.02 of the General Conditions.

5.2 *Final Payment.* Upon final completion and acceptance of the Work in accordance with paragraph 14.07 of the General Conditions, OWNER shall pay the remainder of the Contract Price as recommended by ENGINEER as provided in said paragraph 14.07.

## **ARTICLE 6 INTEREST**

All moneys not paid within thirty (30) days of the due date as provided in Article 14 of the General Conditions, shall bear interest at the rate of 6 percent annually or the minimum required by law at the place of the Project, whichever is greater.

## **ARTICLE 7 CONTRACTOR'S REPRESENTATIONS**

In order to induce OWNER to enter into this Agreement CONTRACTOR makes the following representations:

- 7.1 CONTRACTOR has examined and carefully studied the Contract Documents (including the Addenda indicated in Article 8 hereinafter) and the other related data identified in the Bidding Documents.
- 7.2 CONTRACTOR has visited the site and become familiar with and is satisfied as to the general, local and site conditions possibly affecting cost, progress, performance or furnishing of the Work.

- 7.3 CONTRACTOR is familiar with and is satisfied as to all federal, state, and local Laws and Regulations possibly affecting cost, progress, performance and furnishing of the Work.
- 7.4 CONTRACTOR has carefully studied all reports of explorations and tests of subsurface conditions at or contiguous to the Site and all drawings of physical conditions in or relating to existing surface or subsurface structures at or contiguous to the Site (except Underground Facilities) which have been identified in the Supplementary Conditions as provided in the General Conditions. CONTRACTOR acknowledges such reports and drawings are not Contract Documents and may not be complete for CONTRACTOR's purposes. CONTRACTOR acknowledges OWNER and ENGINEER do not assume responsibility for the accuracy or completeness of information and data shown or indicated in the Contract Documents with respect to Underground Facilities at or contiguous to the site. CONTRACTOR has obtained and carefully studied (or assumes responsibility for having done so) all such additional supplementary examinations, investigations, explorations, tests, studies and data concerning conditions (surface, subsurface and Underground Facilities) at or contiguous to the site or otherwise which may affect cost, progress, performance or furnishing of the construction to be employed by CONTRACTOR and safety precautions and programs incident thereto. CONTRACTOR does not consider any additional examinations, investigations, explorations, tests, studies or data are necessary for the performance and furnishing of the Work at the Contract Price, within the Contract Times and in accordance with the other terms and conditions of the Contract Documents.
- 7.5 CONTRACTOR is aware of the general nature of work to be performed by OWNER and others at the site relating to the Work as indicated in the Contract Documents.
- 7.6 CONTRACTOR has correlated the information known to CONTRACTOR, information and observations obtained from visits to the site, reports and drawings identified in the Contract Documents and all additional examinations, investigations, explorations, tests, studies and data with the Contract Documents.
- 7.7 CONTRACTOR has given ENGINEER written notice of all conflicts, errors, ambiguities or discrepancies CONTRACTOR has discovered in the Contract Documents and the written resolution thereof by ENGINEER is acceptable to CONTRACTOR, and the Contract Documents are generally sufficient to indicate and convey understanding of all terms and conditions for performance and furnishing of the Work.

## **ARTICLE 8 CONTRACT DOCUMENTS**

The Contract Documents which comprise the entire agreement between OWNER and CONTRACTOR concerning the Work consist of the following:

- 8.1 Invitation to Bid
- 8.2 Instructions to Bidders
- 8.3 Bid Form

- 8.4 Bid Bond
- 8.5 Standard Form of Agreement Between Owner and Contractor
- 8.6 Performance Bond
- 8.7 Payment Bond
- 8.8 Notice of Award
- 8.9 Notice to Proceed
- 8.10 General Conditions
- 8.11 Special Conditions
- 8.12 Supplementary Conditions
- 8.13 Summary of Work
- 8.14 Soil Investigation Data for Bidders
- 8.15 Measurement and Payment
- 8.16 Bidder's Qualifications
- 8.17 Submittals
- 8.18 Quality Control
- 8.19 Testing Services
- 8.20 Contract Closeout
- 8.21 Technical Specifications consisting of 15 sections, as listed in the Table of Contents.
- 8.22 Drawings consisting of sheets CS through L2.3 with each sheet bearing the following general title:

Sheet Number	Sheet Title
CS	COVER SHEET
G0.1	GENERAL NOTES & INDEX
EX1.1 – EX1.3	EXISTING CONDITIONS PLAN
C1.1	SITE PLAN
EC0.1	EROSION CONTROL NOTES
EC0.2	EROSION CONTROL CHARTS
EC1.1 - EC3.2	EROSION CONTROL PLAN
EC4.1 – EC4.3	EROSION CONTROL DETAILS
C2.1	WATER PLAN
C2.2-C2.5	SEWER PLAN & PROFILE
C2.6 – C2.7	UTILITY DETAILS

C3.0	PAVING, GRADING, & DRAINAGE PLAN
C3.1	ROAD PLAN AND PROFILE
C3.2	OFF-SITE ROADWAY PLAN
C3.3	TYPICAL ROADWAY SECTIONS
C3.4	DRAINAGE PROFILES
C5.0	STRIPING AND SIGNAGE PLAN
C5.1 – C5.2	SITE DETAILS
C6.1	CROSS SECTIONS
C7.1 – C7.2	TRAFFIC CONTROL DETAILS
L1.1 – L2.3	LANDSCAPING

8.23 Addenda numbers \_\_\_\_\_ to \_\_\_\_\_, inclusive.

Exhibits to this Agreement:

- a. CONTRACTOR's Bid Form – Section 00313
- b. Any modification, including Change Orders, duly delivered after execution of Agreement.

There are no Contract Documents other than those listed above in this Article 8. The Contract Documents may only be amended, modified, or supplemented as provided in paragraph 3.04 of the General Conditions.

## **ARTICLE 9 MISCELLANEOUS**

9.1 Terms used in this Agreement which are defined in Article 1 of the General Conditions will have the meanings indicated in the General Conditions.

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

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

9.4 Any provision or part of the Contract Documents held to be void or unenforceable under any Law or Regulation shall be deemed stricken, and all remaining provisions shall continue to be valid and binding upon OWNER and CONTRACTOR, who agree the Contract Documents shall be reformed to replace such stricken provision or part thereof with a valid and enforceable provision coming as close as possible to expressing the intention of the stricken provision.

IN WITNESS WHEREOF, OWNER and CONTRACTOR have signed this Agreement in six counterparts. Two counterparts each have been delivered to OWNER and CONTRACTOR and one counterpart to ENGINEER. All portions of the Contract Documents have been signed, initialed, or identified by Owner and Contractor or identified by ENGINEER on their behalf.

This Agreement will be effective on \_\_\_\_\_, 2020 (which is the Effective Date of the Agreement).

OWNER \_\_\_\_\_

CONTRACTOR \_\_\_\_\_

BY (typed) \_\_\_\_\_  
Title

BY (typed) \_\_\_\_\_  
Title

BY \_\_\_\_\_

BY \_\_\_\_\_

ATTEST \_\_\_\_\_

ATTEST \_\_\_\_\_

Address for giving notices

Address for giving notices

\_\_\_\_\_  
\_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_

**REFERENCE ONLY**

License No. \_\_\_\_\_

Agent for service of process: \_\_\_\_\_

\_\_\_\_\_

CORPORATE SEAL

CORPORATE SEAL

**DOCUMENT 00611**

**PERFORMANCE BOND**

KNOW ALL MEN BY THESE PRESENTS, \_\_\_\_\_,  
(Name & Address of Contractor)

hereinafter called "Principal" and \_\_\_\_\_,  
(Name & Address of Surety)

\_\_\_\_\_ of \_\_\_\_\_

State of \_\_\_\_\_, hereinafter called the "Surety" are held and  
firmly bound unto \_\_\_\_\_

hereinafter called the "Owner" in the penal sum of \_\_\_\_\_

\_\_\_\_\_ Dollars (\$ \_\_\_\_\_)  
(Contract Sum)

lawful money of the United States of America, to be paid to OWNER, for the payment whereof well and truly to be made we do bind ourselves, our respective executors, administrators, successors and assigns, jointly and severally, firmly by these presents.

WHEREAS, the above bounden Principal has entered into a certain contract with the Owner dated the \_\_\_\_\_ day of \_\_\_\_\_, 20\_\_\_\_ for the construction of:

**REFERENCE ONLY**

**Bid No. 22-20/21 - Phase I Improvements Florence County Industrial Park East**

which said contract is incorporated hereby by reference and made a part hereof and is hereinafter referred to as the Construction Contract.

NOW THEREFORE, THE CONDITION OF THIS OBLIGATION is such, if the Principal shall promptly and faithfully perform and comply with the terms and conditions of said contract; and shall indemnify and save harmless the Owner against and from all costs, expenses, damages, injury or loss to which said Owner may be subjected by reason of any wrongdoing, including patent infringement, misconduct, want of care or skill, default, or failure of performance on the part of said Principal, its agents, subcontractors or employees, in the execution or performance of said Construction Contract, then this obligation shall be null and void; otherwise it shall remain in full force and effect.

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

2. If the Contractor performs the Construction Contract, the Surety and the Contractor shall have no obligation under this Bond, except to participate in conferences as provided in Subparagraph 3.1.
3. If there is no Owner Default, the Surety's obligations under this Bond shall arise after:
  - 3.1 The Owner has notified the Contractor and the Surety at its address described in Paragraph 10 below, the Owner is considering declaring a Contractor Default and has requested and attempted to arrange a conference with the Contractor and the Surety to be held not later than fifteen days after receipt of such notice to discuss methods of performing the Construction Contract. If the Owner, the Contractor and the Surety agree, the Contractor shall be allowed a reasonable time to perform the Construction Contract, but such an agreement shall not waive the Owner's right, if any, subsequently to declare a Contractor Default; and
  - 3.2 The Owner has declared a Contractor Default and formally terminated the Contractor's right to complete the contract. Such Contractor Default shall not be declared earlier than twenty days after the Contractor and the Surety have received notice as provided in Subparagraph 3.1; and
  - 3.3 The Owner has agreed to pay the Balance of the Contract Price to the Surety in accordance with the terms of the Construction Contract or to a Contractor selected to perform the Construction Contract in accordance with the terms of the contract with the Owner.
4. When the Owner has satisfied the conditions of Paragraph 3, the Surety shall promptly and at the Surety's expense, take one of the following actions:

**REFERENCE ONLY**

- 4.1 Arrange for the Contractor, with consent of the Owner, to perform and complete the Construction Contract; or
- 4.2 Undertake to perform and complete the Construction Contract itself, through its agents or through independent Contractors; or
- 4.3 Obtain bids or negotiated proposals from qualified Contractors acceptable to the Owner in a contract for performance and completion of the Construction Contract, arrange for a contract to be prepared for execution by the Owner and the Contractor selected with the Owner's concurrence, to be secured with performance and payment bonds executed by a qualified surety equivalent to the bonds issued on the Construction Contract, and pay to the Owner the amount of damages as described in Paragraph 6 in excess of the Balance of the Contract Price incurred by the Owner resulting from the Contractor's default; or
- 4.4 Waive its right to perform and complete, arrange for completion, or obtain a new Contractor and with reasonable promptness under the circumstances:

- 4.4.1 After investigation, determine the amount for which it may be liable to the Owner and, as soon as practicable after the amount is determined, tender payment therefor to the Owner; or
  - 4.4.2 Deny liability in whole or in part and notify the Owner citing reasons therefor.
5. If the Surety does not proceed as provided in paragraph 4 with reasonable promptness, the Surety shall be deemed to be in default on this Bond fifteen days after receipt of an additional written notice from the Owner to the Surety demanding that the Surety perform its obligations under this Bond, and the Owner shall be entitled to enforce any remedy available to the Owner. If the Surety proceeds as provided in Subparagraph 4.4, and the Owner refuses the payment tendered or the Surety has denied liability, in whole or in part, without further notice the Owner shall be entitled to enforce any remedy available to the Owner.
6. After the Owner has terminated the Contractor's right to complete the Construction Contract, and if the Surety elects to act under Subparagraph 4.1, 4.2, or 4.3 above, then the responsibilities of the Surety to the Owner shall not be greater than those of the Contractor under the Construction Contract. To the limit of the amount of this Bond, but subject to commitment by the Owner of the Balance of the Contract Price to mitigation of costs and damages on the Construction Contract, the Surety is obligated without duplication for:
  - 6.1 The responsibilities of the Contractor for correction of defective work and completion of the Construction Contract:
  - 6.2 Additional legal, design professional and delay costs resulting from the Contractor's Default, and resulting from the actions or failure to act of the Surety under Paragraph 4; and
  - 6.3 Liquidated damages, or if no liquidated damages are specified in the Construction Contract, actual damages caused by delayed performance or non-performance of the Contractor.
7. The Surety shall not be liable to the Owner or others for obligations of the Contractor unrelated to the Contract, and the Balance of the Contract Price shall not be reduced or set off on account of any such unrelated obligations. No right of action shall accrue on this Bond to any person or entity other than the Owner or its heirs, executors, administrators, or successors.
8. The Surety hereby waives notice of any changes, including changes of time, to the Construction Contract or to related subcontracts, purchase orders and other obligations.
9. Any proceeding, legal or equitable, under this Bond may be instituted in any court of competent jurisdiction in the location in which the work or part of the work is located and shall be instituted within two years after Contractor Default or within two years after the Contractor ceased working or within two years after the Surety refuses or fails to perform its obligations under this Bond, whichever occurs first. If the provisions of this Paragraph are void or prohibited by law, the minimum

REFERENCE ONLY

period of limitation available to sureties as a defense in the jurisdiction of the suit shall be applicable.

10. Notice to the Surety, the Owner or the Contractor shall be mailed or delivered to the address shown on the signature page.
11. When this Bond has been furnished to comply with a statutory or other legal requirement in the location where the construction was to be performed, any provision in this Bond conflicting with said statutory or legal requirement shall be deemed deleted herefrom and provisions conforming to such statutory or other legal requirement shall be deemed incorporated herein. The intent is this Bond shall be construed as a statutory bond and not as a common law bond.
12. DEFINITIONS:
  - 12.1 Balance of the Contract Price: The total amount payable by the Owner to the Contractor under the Construction Contract after all proper adjustments have been made, including allowance to the Contractor of any amounts received or to be received by the Owner in settlement of insurance or other claims for damages to which the Contractor is entitled, reduced by all valid and proper payments made to or on behalf of the Contractor under the Construction Contract.
  - 12.2 Construction Contract: The agreement between the Owner and the Contractor identified on the signature page, including all Contract Documents and changes thereto;
  - 12.3 Contractor Default: Failure of the Contractor, which has neither been remedied nor waived, to perform or otherwise to comply with the terms of the Construction Contract.
  - 12.4 Owner Default: Failure of the Owner, which has neither been remedied nor waived, to pay the Contractor as required by the Construction Contract or to perform and complete or comply with the other terms thereof.

**REFERENCE ONLY**

IN WITNESS WHEREOF, this instrument is executed in six counterparts, each one of which shall be deemed an original, on this the \_\_\_\_ day of \_\_\_\_\_, 20\_\_.

**CONTRACTOR AS PRINCIPAL:**

\_\_\_\_\_  
Principal

\_\_\_\_\_  
(Principal) Secretary

By: \_\_\_\_\_  
(Signature & Title)

(SEAL)

\_\_\_\_\_  
Address

\_\_\_\_\_

\_\_\_\_\_  
Witness as to Principal

\_\_\_\_\_  
Address

\_\_\_\_\_

**SURETY:**

**REFERENCE ONLY**

\_\_\_\_\_  
Surety (Company)

\_\_\_\_\_  
(Surety) Secretary

By: \_\_\_\_\_  
Attorney-in-Fact

(SEAL)

\_\_\_\_\_  
Witness as to Surety

\_\_\_\_\_  
Address

\_\_\_\_\_

Notes:

1. Date of Bond must not be prior to date of Contract. If Contractor is a Partnership, all partners should execute bond.
2. Bond must be countersigned by a South Carolina resident agent.
3. Surety companies executing bonds must appear on the Treasury Department's most current list (Circular 570 as amended) and be authorized to transact business in the state where the project is located.

# REFERENCE ONLY

**DOCUMENT 00621**

**PAYMENT BOND**

KNOW ALL MEN BY THESE PRESENTS, \_\_\_\_\_,  
(Name & Address of Contractor)

hereinafter called "Principal" and \_\_\_\_\_,  
(Name & Address of Surety)

\_\_\_\_\_ of \_\_\_\_\_

State of \_\_\_\_\_, hereinafter called the "Surety" are held and  
firmly bound unto \_\_\_\_\_

hereinafter called the "Owner" in the penal sum of \_\_\_\_\_

\_\_\_\_\_ Dollars (\$ \_\_\_\_\_)  
(Contract Sum)

lawful money of the United States of America, to be paid to OWNER, for the payment whereof well and truly to be made we do bind ourselves, our respective executors, administrators, successors and assigns, jointly and severally, firmly by these presents.

WHEREAS, the above bounden Principal has entered into a certain contract with the Owner dated the \_\_\_\_\_ day of \_\_\_\_\_, 20\_\_\_\_ for the construction of:

**REFERENCE ONLY**  
**Bid No. 22-20/21 - Phase I Improvements Florence County Industrial Park East**

which said contract is incorporated hereby by reference and made a part hereof and is hereinafter referred to as the Construction Contract.

NOW THEREFORE, THE CONDITION OF THIS OBLIGATION is such, if the Principal shall promptly make payment to all claimants as hereinafter defined, for all labor and materials supplied in the prosecution of the work provided for in said Construction Contract, then this obligation shall be void; otherwise, it shall remain in full force and effect, subject, however, to the following conditions:

1. The Contractor and the Surety, jointly and severally, bind themselves, their heirs, executors, administrators, successors and assigns to the Owner for the performance of the Construction Contract, which is incorporated herein by reference.
2. With respect to the Owner, this obligation shall be null and void if the Contractor:
  - 2.1 Promptly makes payment, directly or indirectly, for all sums due Claimants; and

- 2.2 Defends, indemnifies and holds harmless the Owner from claims, demands, liens or suits by any person or entity whose claim, demand, lien or suit is for payment for labor, materials or equipment furnished for use in the performance of the Construction Contract, provided the Owner has promptly notified the Contractor and the Surety (at the address described in Paragraph 12) of any claims, demands, liens or suits and tendered defense of such claims, demands, liens or suits to the Contractor and the Surety, and provided there is no Owner Default.
3. With respect to Claimants, this obligation shall be null and void if the Contractor promptly makes payment, directly or indirectly, for all sums due.
4. The Surety shall have no obligation to Claimants under this Bond until:
  - 4.1 Claimants who are employed by or have a direct contract with the Contractor have given notice to the Surety (at the address described in Paragraph 12) and sent a copy, or notice thereof, to the Owner, stating a claim is being made under this Bond and, with substantial accuracy, the amount of claim.
  - 4.2 Claimants who do not have a direct contract with the Contractor:
    - 4.2.1 Have furnished written notice to the Contractor and sent a copy, or notice thereof, to the Owner, within 90-days after having last performed labor or last furnished materials or equipment included in the claim stating, with substantial accuracy, the amount of the claim and the name of the party to whom the materials were furnished or supplied or for whom the labor was performed; and
    - 4.2.2 Have either received a rejection in whole or in part from the Contractor, or not received within 30-days of furnishing the above notice, any communication from the Contractor by which the Contractor has indicated the claim will be paid directly or indirectly; and
    - 4.2.3 Not having been paid within 30-days, have sent a written notice to the Surety (at the address described in Paragraph 12) and sent a copy, or notice thereof, to the Owner, stating a claim is being made under this Bond and enclosing a copy of the previous written notice furnished to the Contractor.
5. Compliance shall be considered sufficient if a notice required by paragraph 4 is given by the Owner to the Contractor or to the Surety.
6. When the Claimant has satisfied the conditions of Paragraph 4, the Surety shall promptly and at the Surety's expense take the following actions:
  - 6.1 Send an answer to the Claimant, with a copy to the Owner, within 45-days after receipt of the claim stating the amounts undisputed and basis for challenging any amounts disputed.

REFERENCE ONLY

- 6.2 Pay or arrange for payment of any undisputed amounts.
7. The Surety's total obligation shall not exceed the amount of this Bond, and the amount of this Bond shall be credited for any payments made in good faith by the Surety.
  8. Amounts owed by the Owner to the Contractor under the Construction Contract shall be used for the performance of the Construction Contract and to satisfy claims, if any, under any Construction Performance Bond. By the Contractor furnishing and the Owner accepting this Bond, they agree all funds earned by the Contractor in the performance of the Construction Contract are dedicated to satisfying obligations of the Contractor and the Surety under this Bond, subject to the Owner's priority to use the funds for the completion of the work.
  9. The Surety shall not be liable to the Owner, Claimants or others for obligations of the Contractor unrelated to the Construction Contract. The Owner shall not be liable for payment of any costs or expenses of any Claimant under this Bond and shall have under this Bond no obligations to make payments to, give notices on behalf of, or otherwise have obligations to Claimants under this Bond.
  10. The Surety hereby waives notice of any change, including changes of time, to the Construction Contract or to related subcontracts, purchase orders and other obligations.
  11. No suit or action shall be commenced by a Claimant under this bond other than in a court of competent jurisdiction in the location in which the work or part of the work is located or after the expiration of one year from the date (1) on which the Claimant gave the notice required by Subparagraph 4.1 or Clause 4.2.3, or (2) on which the last labor or service was performed by anyone or the last materials or equipment were furnished by anyone under the Construction Contract, whichever of (1) or (2) first occurs. If the provisions of this paragraph are void or prohibited by law, the minimum period of limitation available to Sureties as a defense in the jurisdiction of the suit shall be applicable.
  12. Notice to the Surety, Owner or Contractor shall be mailed or delivered to the address shown on the signature page. Actual receipt of notice by the Surety, Owner, or Contractor, however accomplished, shall be sufficient compliance as of the date received at the address shown on the signature page.
  13. When this Bond has been furnished to comply with a statutory or other legal requirement in the location where the construction was to be performed, any provision in the Bond conflicting with said statutory or legal requirement shall be deemed deleted herefrom and provisions conforming to such statutory or other legal requirement shall be deemed incorporated herein. The intent is this Bond shall be construed as a statutory bond and not as a common law bond.
  14. Upon request of any person or entity appearing to be a potential beneficiary of this Bond, the Contractor shall promptly furnish a copy of this Bond or shall permit a copy to be made.
  15. DEFINITIONS:

- 15.1 Claimant: An individual or entity having a direct contract with the Contractor or with a Subcontractor of the Contractor to furnish labor, material, or equipment for use in the performance of the Contract. The intent of this Bond shall be to include without limitation in the terms "labor, materials or equipment," that part of water, gas, power, light, heat, oil, gasoline, telephone service or rental equipment used in the Construction Contract, architectural and engineering services required for performance of the work of the Contractor and the Contractor's Subcontractors, and all other items for which a mechanic's lien may be asserted in the jurisdiction where the labor, materials or equipment were furnished.
- 15.2 Construction Contract: The agreement between the Owner and the Contractor identified on the signature page, including all Contract Documents and changes thereto.
- 15.3 Owner Default: Failure of the Owner, which has neither been remedied nor waived, to pay the Contractor as required by the Construction Contract or to perform and complete or comply with the other terms thereof.

# REFERENCE ONLY

IN WITNESS WHEREOF, this instrument is executed in six counterparts, each one of which shall be deemed an original, on this the \_\_\_\_ day of \_\_\_\_\_, 20\_\_.

**CONTRACTOR AS PRINCIPAL:**

\_\_\_\_\_  
Principal

\_\_\_\_\_  
(Principal) Secretary

By: \_\_\_\_\_  
(Signature & Title)

(SEAL)

\_\_\_\_\_  
Address

\_\_\_\_\_

\_\_\_\_\_  
Witness as to Principal

\_\_\_\_\_  
Address

\_\_\_\_\_

**SURETY:**

**REFERENCE ONLY**

\_\_\_\_\_  
Surety (Company)

\_\_\_\_\_  
(Surety) Secretary

By: \_\_\_\_\_  
Attorney-in-Fact

(SEAL)

\_\_\_\_\_  
Witness as to Surety

\_\_\_\_\_  
Address

\_\_\_\_\_

Notes:

1. Date of Bond must not be prior to date of Contract. If Contractor is a Partnership, all partners should execute bond.
2. Bond must be countersigned by a South Carolina resident agent.
3. Surety companies executing bonds must appear on the Treasury Department's most current list (Circular 570 as amended) and be authorized to transact business in the state where the project is located.

# REFERENCE ONLY

**SECTION 00631**  
**NOTICE OF AWARD**

DATED: \_\_\_\_\_

TO: \_\_\_\_\_  
(Bidder)

ADDRESS: \_\_\_\_\_  
\_\_\_\_\_

JOB NO.: 28601.0001

PROJECT: Bid No. 22-20/21 - Phase I Improvements Florence County Industrial Park East

**CONTRACT**

FOR: Improvements to approximately 18-acre parcel within the Florence County Industrial Park East, Florence County, South Carolina. The development will include an approximately 100,200 SF mass graded pad and site improvements, ±635 linear feet of asphalt paved roadway, and asphalt paved dedicated right-turn lane, including gravel turnaround, with center concrete curb and gutter island, clearing and grubbing; grading; erosion control; ditched storm drainage system with RCP culverts with wet stormwater detention pond; ±80 of 12" DIP water line extension, ±810 linear of 12" PVC - C900 - DR 18 water line extension, jack & bore ±45 linear feet of 20" steel casing; ±3,734 linear feet of 12" PVC – SDR 26 sewer service line.



You are notified your Bid dated \_\_\_\_\_, 20\_\_\_\_, for the above Contract has been considered. You are the apparent successful bidder and have been awarded a contract for:

\_\_\_\_\_  
(Indicate total Work, alternates or sections of Work awarded)

The Contract Price of your contract is \_\_\_\_\_

\_\_\_\_\_ Dollars (\$\_\_\_\_\_).

\_\_\_\_\_ copies of each of the proposed Contract Documents (except drawings) accompany this Notice of Award.

\_\_\_\_\_ sets of the Drawings will be delivered separately or otherwise made available to you

immediately.

You must comply with the following conditions precedent within 15 days of this Notice of Award, which is by \_\_\_\_\_, 20\_\_\_\_\_.

1. You must deliver to the OWNER \_\_\_\_ fully executed counterparts of the Agreement including all the Contract Documents. Each of the Contract Documents must bear your signature on the page (pages \_\_\_\_.)
2. You must deliver with the executed Agreement the Contract Security (Bonds) as specified in the Instructions to Bidders (Article 8), General Conditions (paragraph 5.01) and Supplementary Conditions.
3. (List other conditions precedent)

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

Within ten days after you comply with the above conditions, OWNER will return to you one fully signed counterpart of the Agreement with the Contract Documents attached.

\_\_\_\_\_  
OWNER

By: \_\_\_\_\_

**REFERENCE ONLY**  
(Title)

**ACCEPTANCE OF AWARD**

\_\_\_\_\_  
(Contractor)

By: \_\_\_\_\_  
(Authorized Signature)

\_\_\_\_\_  
(Title)

\_\_\_\_\_  
(Date)

**Section 00641**

**NOTICE TO PROCEED**

DATED: \_\_\_\_\_

TO: \_\_\_\_\_  
(Bidder)

ADDRESS: \_\_\_\_\_  
\_\_\_\_\_

JOB NO.: 28601.0001

PROJECT: Bid No. 22-20/21 - Phase I Improvements Florence County Industrial Park East

**CONTRACT**

FOR: Improvements for ±2,700 linear feet of asphalt paved roadway, including roundabout, with concrete curb and gutter, to serve the Florence Business Park, including clearing and grubbing; grading; erosion control; associated closed storm drainage system, with 2 stormwater ponds; 1 traffic signal; and ±1,450 linear feet of 12" PVC - C900 - DR 18 water line extension, ±690 linear feet of 10" PVC - C900 - DR 18 water line extension, and ±15 linear feet of 6" PVC - C900 - DR 18 water service lines; and ±55 linear feet of 18" PVC - SDR 35 gravity sewer line extension; and ±1,320 linear feet of 12" PVC - SDR 35 gravity sewer line extension; and ±130 linear feet of 8" PVC - SDR 35 gravity sewer line extension; and ±120 linear feet 6" PVC - SDR 26 sewer service lines.

\_\_\_\_\_  
\_\_\_\_\_  
You are notified the Contract Times under the above contract will commence to run on \_\_\_\_\_, 20\_\_\_. By such date, you are to start performing your obligations under the Contract Documents. In accordance with Article 3 of the Agreement the dates of Substantial Completion and completion and readiness for final payment are \_\_\_\_\_, 20\_\_ and \_\_\_\_\_, 20\_\_, respectively.

Before you may start any Work at the site, paragraph 2.01 of the General Conditions provides you and OWNER must each deliver to the other (with copies to ENGINEER and other identified additional insureds) certificates of insurance which each is required to purchase and maintain in accordance with the Contract Documents.

Before you may start any Work at the site, you must have submitted the following: Certificate of Insurance, Performance Bond, and Payment Bond.

\_\_\_\_\_  
OWNER

By: \_\_\_\_\_  
(Authorized Signature)

\_\_\_\_\_  
(Title)

**ACCEPTANCE OF NOTICE TO PROCEED**

\_\_\_\_\_  
(Contractor)

By: \_\_\_\_\_  
(Authorized Signature)

\_\_\_\_\_  
(Title)

\_\_\_\_\_  
(Date)

**REFERENCE ONLY**

**Engineers Joint Documents Committee  
Design and Construction Related Documents  
Instructions and License Agreement**

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**You should carefully read the following terms and conditions before using this document. Commencement of use of this document indicates your acceptance of these terms and conditions. If you do not agree to them, you should promptly return the materials to the vendor, and your money will be refunded.**

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**Term:**

The license is effective until terminated. You may terminate it at any time by destroying **EJCDC Design and Construction Related Documents** altogether with all copies, modifications and merged portions in any form. It will also terminate upon conditions set forth elsewhere in this Agreement or if you fail to comply with any term or condition of this Agreement. You agree upon such termination to destroy **EJCDC Design and Construction Related Documents** along with all copies, modifications and merged portions in any form.

**Limited Warranty:**

EJCDC warrants the CDs and diskettes on which **EJCDC Design and Construction Related Documents** is furnished to be free from defects in materials and workmanship under normal use for a period of ninety (90) days from the date of delivery to you as evidenced by a copy of your receipt.

**There is no other warranty of any kind, either expressed or implied, including, but not limited to the implied warranties of merchantability and fitness for a particular purpose. Some states do not allow the exclusion of implied warranties, so the above exclusion may not apply to you. This warranty gives you specific legal rights and you may also have other rights which vary from state to state.**

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**Limitations of Remedies:**

EJCDC's entire liability and your exclusive remedy shall be:

1. the replacement of any document not meeting EJCDC's "Limited Warranty" which is returned to EJCDC's selling agent with a copy of your receipt, or
2. if EJCDC's selling agent is unable to deliver a replacement CD or diskette which is free of defects in materials and workmanship, you may terminate this Agreement by returning EJCDC Document and your money will be refunded.

In no event will EJCDC be liable to you for any damages, including any lost profits, lost savings or other incidental or consequential damages arising out of the use or inability to use **EJCDC Design and Construction Related Documents** even if EJCDC has been advised of the possibility of such damages, or for any claim by any other party.

Some states do not allow the limitation or exclusion of liability for incidental or consequential damages, so the above limitation or exclusion may not apply to you.

**General:**

You may not sublicense, assign, or transfer this license except as expressly provided in this Agreement. Any attempt otherwise to sublicense, assign, or transfer any of the rights, duties, or obligations hereunder is void.

This Agreement shall be governed by the laws of the State of Virginia. Should you have any questions concerning this Agreement, you may contact EJCDC by writing to:

Arthur Schwartz, Esq.  
General Counsel

National Society of Professional Engineers  
1420 King Street  
Alexandria, VA 22314

Phone: (703) 684-2845  
Fax: (703) 836-4875  
e-mail: aschwartz@nspe.org

**You acknowledge that you have read this agreement, understand it and agree to be bound by its terms and conditions. You further agree that it is the complete and exclusive statement of the agreement between us which supersedes any proposal or prior agreement, oral or written, and any other communications between us relating to the subject matter of this agreement.**

**REFERENCE ONLY**

This document has important legal consequences; consultation with an attorney is encouraged with respect to its use or modification. This document should be adapted to the particular circumstances of the contemplated Project and the controlling Laws and Regulations.

# STANDARD GENERAL CONDITIONS OF THE CONSTRUCTION CONTRACT

Prepared by

**ENGINEERS JOINT CONTRACT DOCUMENTS COMMITTEE**

and

Issued and Published Jointly by

**ACEC**

AMERICAN COUNCIL OF ENGINEERING COMPANIES



**ASCE** American Society  
of Civil Engineers

**PE** National Society of  
Professional Engineers  
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NATIONAL SOCIETY OF PROFESSIONAL ENGINEERS

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CONSTRUCTION SPECIFICATIONS INSTITUTE

These General Conditions have been prepared for use with the Suggested Forms of Agreement Between Owner and Contractor (EJCDC C-520 or C-525, 2007 Editions). Their provisions are interrelated and a change in one may necessitate a change in the other. Comments concerning their usage are contained in the Narrative Guide to the EJCDC Construction Documents (EJCDC C-001, 2007 Edition). For guidance in the preparation of Supplementary Conditions, see Guide to the Preparation of Supplementary Conditions (EJCDC C-800, 2007 Edition).

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# STANDARD GENERAL CONDITIONS OF THE CONSTRUCTION CONTRACT

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## ARTICLE 1 – DEFINITIONS AND TERMINOLOGY

### 1.01 *Defined Terms*

- A. Wherever used in the Bidding Requirements or Contract Documents and printed with initial capital letters, the terms listed below will have the meanings indicated which are applicable to both the singular and plural thereof. In addition to terms specifically defined, terms with initial capital letters in the Contract Documents include references to identified articles and paragraphs, and the titles of other documents or forms.
1. *Addenda*—Written or graphic instruments issued prior to the opening of Bids which clarify, correct, or change the Bidding Requirements or the proposed Contract Documents.
  2. *Agreement*—The written instrument which is evidence of the agreement between Owner and Contractor covering the Work.
  3. *Application for Payment*—The form acceptable to Engineer which is to be used by Contractor during the course of the Work in requesting progress or final payments and which is to be accompanied by such supporting documentation as is required by the Contract Documents.
  4. *Asbestos*—Any material that contains more than one percent asbestos and is friable or is releasing asbestos fibers into the air above current action levels established by the United States Occupational Safety and Health Administration.
  5. *Bid*—The offer or proposal of a Bidder submitted on the prescribed form setting forth the prices for the Work to be performed.
  6. *Bidder*—The individual or entity who submits a Bid directly to Owner.
  7. *Bidding Documents*—The Bidding Requirements and the proposed Contract Documents (including all Addenda).
  8. *Bidding Requirements*—The advertisement or invitation to bid, Instructions to Bidders, Bid security of acceptable form, if any, and the Bid Form with any supplements.
  9. *Change Order*—A document recommended by Engineer which is signed by Contractor and Owner and authorizes an addition, deletion, or revision in the Work or an adjustment in the Contract Price or the Contract Times, issued on or after the Effective Date of the Agreement.
  10. *Claim*—A demand or assertion by Owner or Contractor seeking an adjustment of Contract Price or Contract Times, or both, or other relief with respect to the terms of the Contract. A demand for money or services by a third party is not a Claim.
  11. *Contract*—The entire and integrated written agreement between the Owner and Contractor concerning the Work. The Contract supersedes prior negotiations, representations, or agreements, whether written or oral.

REFERENCE ONLY

12. *Contract Documents*—Those items so designated in the Agreement. Only printed or hard copies of the items listed in the Agreement are Contract Documents. Approved Shop Drawings, other Contractor submittals, and the reports and drawings of subsurface and physical conditions are not Contract Documents.
13. *Contract Price*—The moneys payable by Owner to Contractor for completion of the Work in accordance with the Contract Documents as stated in the Agreement (subject to the provisions of Paragraph 11.03 in the case of Unit Price Work).
14. *Contract Times*—The number of days or the dates stated in the Agreement to: (i) achieve Milestones, if any; (ii) achieve Substantial Completion; and (iii) complete the Work so that it is ready for final payment as evidenced by Engineer's written recommendation of final payment.
15. *Contractor*—The individual or entity with whom Owner has entered into the Agreement.
16. *Cost of the Work*—See Paragraph 11.01 for definition.
17. *Drawings*—That part of the Contract Documents prepared or approved by Engineer which graphically shows the scope, extent, and character of the Work to be performed by Contractor. Shop Drawings and other Contractor submittals are not Drawings as so defined.
18. *Effective Date of the Agreement*—The date indicated in the Agreement on which it becomes effective, but if no such date is indicated, it means the date on which the Agreement is signed and delivered by the last of the two parties to sign and deliver.
19. *Engineer*—The individual or entity named as such in the Agreement.
20. *Field Order*—A written order issued by Engineer which requires minor changes in the Work but which does not involve a change in the Contract Price or the Contract Times.
21. *General Requirements*—Sections of Division 1 of the Specifications.
22. *Hazardous Environmental Condition*—The presence at the Site of Asbestos, PCBs, Petroleum, Hazardous Waste, or Radioactive Material in such quantities or circumstances that may present a substantial danger to persons or property exposed thereto.
23. *Hazardous Waste*—The term Hazardous Waste shall have the meaning provided in Section 1004 of the Solid Waste Disposal Act (42 USC Section 6903) as amended from time to time.
24. *Laws and Regulations; Laws or Regulations*—Any and all applicable laws, rules, regulations, ordinances, codes, and orders of any and all governmental bodies, agencies, authorities, and courts having jurisdiction.
25. *Liens*—Charges, security interests, or encumbrances upon Project funds, real property, or personal property.
26. *Milestone*—A principal event specified in the Contract Documents relating to an intermediate completion date or time prior to Substantial Completion of all the Work.

27. *Notice of Award*—The written notice by Owner to the Successful Bidder stating that upon timely compliance by the Successful Bidder with the conditions precedent listed therein, Owner will sign and deliver the Agreement.
28. *Notice to Proceed*—A written notice given by Owner to Contractor fixing the date on which the Contract Times will commence to run and on which Contractor shall start to perform the Work under the Contract Documents.
29. *Owner*—The individual or entity with whom Contractor has entered into the Agreement and for whom the Work is to be performed.
30. *PCBs*—Polychlorinated biphenyls.
31. *Petroleum*—Petroleum, including crude oil or any fraction thereof which is liquid at standard conditions of temperature and pressure (60 degrees Fahrenheit and 14.7 pounds per square inch absolute), such as oil, petroleum, fuel oil, oil sludge, oil refuse, gasoline, kerosene, and oil mixed with other non-Hazardous Waste and crude oils.
32. *Progress Schedule*—A schedule, prepared and maintained by Contractor, describing the sequence and duration of the activities comprising the Contractor's plan to accomplish the Work within the Contract Times.
33. *Project*—The total construction of which the Work to be performed under the Contract Documents may be the whole, or a part.
34. *Project Manual*—The bound documentary information prepared for bidding and constructing the Work. A listing of the contents of the Project Manual, which may be bound in one or more volumes, is contained in the table(s) of contents.
35. *Radioactive Material*—Source, special nuclear, or byproduct material as defined by the Atomic Energy Act of 1954 (42 USC Section 2011 et seq.) as amended from time to time.
36. *Resident Project Representative*—The authorized representative of Engineer who may be assigned to the Site or any part thereof.
37. *Samples*—Physical examples of materials, equipment, or workmanship that are representative of some portion of the Work and which establish the standards by which such portion of the Work will be judged.
38. *Schedule of Submittals*—A schedule, prepared and maintained by Contractor, of required submittals and the time requirements to support scheduled performance of related construction activities.
39. *Schedule of Values*—A schedule, prepared and maintained by Contractor, allocating portions of the Contract Price to various portions of the Work and used as the basis for reviewing Contractor's Applications for Payment.

40. *Shop Drawings*—All drawings, diagrams, illustrations, schedules, and other data or information which are specifically prepared or assembled by or for Contractor and submitted by Contractor to illustrate some portion of the Work.
41. *Site*—Lands or areas indicated in the Contract Documents as being furnished by Owner upon which the Work is to be performed, including rights-of-way and easements for access thereto, and such other lands furnished by Owner which are designated for the use of Contractor.
42. *Specifications*—That part of the Contract Documents consisting of written requirements for materials, equipment, systems, standards and workmanship as applied to the Work, and certain administrative requirements and procedural matters applicable thereto.
43. *Subcontractor*—An individual or entity having a direct contract with Contractor or with any other Subcontractor for the performance of a part of the Work at the Site.
44. *Substantial Completion*—The time at which the Work (or a specified part thereof) has progressed to the point where, in the opinion of Engineer, the Work (or a specified part thereof) is sufficiently complete, in accordance with the Contract Documents, so that the Work (or a specified part thereof) can be utilized for the purposes for which it is intended. The terms “substantially complete” and “substantially completed” as applied to all or part of the Work refer to Substantial Completion thereof.
45. *Successful Bidder*—The Bidder submitting a responsive Bid to whom Owner makes an award.
46. *Supplementary Conditions*—That part of the Contract Documents which amends or supplements these General Conditions.
47. *Supplier*—A manufacturer, fabricator, supplier, distributor, materialman, or vendor having a direct contract with Contractor or with any Subcontractor to furnish materials or equipment to be incorporated in the Work by Contractor or Subcontractor.
48. *Underground Facilities*—All underground pipelines, conduits, ducts, cables, wires, manholes, vaults, tanks, tunnels, or other such facilities or attachments, and any encasements containing such facilities, including those that convey electricity, gases, steam, liquid petroleum products, telephone or other communications, cable television, water, wastewater, storm water, other liquids or chemicals, or traffic or other control systems.
49. *Unit Price Work*—Work to be paid for on the basis of unit prices.
50. *Work*—The entire construction or the various separately identifiable parts thereof required to be provided under the Contract Documents. Work includes and is the result of performing or providing all labor, services, and documentation necessary to produce such construction, and furnishing, installing, and incorporating all materials and equipment into such construction, all as required by the Contract Documents.
51. *Work Change Directive*—A written statement to Contractor issued on or after the Effective Date of the Agreement and signed by Owner and recommended by Engineer ordering an

addition, deletion, or revision in the Work, or responding to differing or unforeseen subsurface or physical conditions under which the Work is to be performed or to emergencies. A Work Change Directive will not change the Contract Price or the Contract Times but is evidence that the parties expect that the change ordered or documented by a Work Change Directive will be incorporated in a subsequently issued Change Order following negotiations by the parties as to its effect, if any, on the Contract Price or Contract Times.

## 1.02 Terminology

A. The words and terms discussed in Paragraph 1.02.B through F are not defined but, when used in the Bidding Requirements or Contract Documents, have the indicated meaning.

### B. *Intent of Certain Terms or Adjectives:*

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

### C. *Day:*

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

### D. *Defective:*

1. The word “defective,” when modifying the word “Work,” refers to Work that is unsatisfactory, faulty, or deficient in that it:
  - a. does not conform to the Contract Documents; or
  - b. does not meet the requirements of any applicable inspection, reference standard, test, or approval referred to in the Contract Documents; or
  - c. has been damaged prior to Engineer’s recommendation of final payment (unless responsibility for the protection thereof has been assumed by Owner at Substantial Completion in accordance with Paragraph 14.04 or 14.05).

E. *Furnish, Install, Perform, Provide:*

1. The word “furnish,” when used in connection with services, materials, or equipment, shall mean to supply and deliver said services, materials, or equipment to the Site (or some other specified location) ready for use or installation and in usable or operable condition.
2. The word “install,” when used in connection with services, materials, or equipment, shall mean to put into use or place in final position said services, materials, or equipment complete and ready for intended use.
3. The words “perform” or “provide,” when used in connection with services, materials, or equipment, shall mean to furnish and install said services, materials, or equipment complete and ready for intended use.
4. When “furnish,” “install,” “perform,” or “provide” is not used in connection with services, materials, or equipment in a context clearly requiring an obligation of Contractor, “provide” is implied.

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

## ARTICLE 2 – PRELIMINARY MATTERS

### 2.01 *Delivery of Bonds and Evidence of Insurance*

- A. When Contractor delivers the executed counterparts of the Agreement to Owner, Contractor shall also deliver to Owner such bonds as Contractor may be required to furnish.
- B. ~~*Evidence of Insurance:* Before any Work at the Site is started, Contractor and Owner shall each deliver to the other, with copies to each additional insured identified in the Supplementary Conditions, certificates of insurance (and other evidence of insurance which either of them or any additional insured may reasonably request) which Contractor and Owner respectively are required to purchase and maintain in accordance with Article 5.~~

### 2.02 *Copies of Documents*

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

### 2.03 *Commencement of Contract Times; Notice to Proceed*

- A. The Contract Times will commence to run on the thirtieth day after the Effective Date of the Agreement or, if a Notice to Proceed is given, on the day indicated in the Notice to Proceed. A Notice to Proceed may be given at any time within 30 days after the Effective Date of the Agreement. In no event will the Contract Times commence to run later than the sixtieth day after the day of Bid opening or the thirtieth day after the Effective Date of the Agreement, whichever date is earlier.

## 2.04 *Starting the Work*

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

## 2.05 *Before Starting Construction*

- A. *Preliminary Schedules:* Within 10 days after the Effective Date of the Agreement (unless otherwise specified in the General Requirements), Contractor shall submit to Engineer for timely review:
  - 1. a preliminary Progress Schedule indicating the times (numbers of days or dates) for starting and completing the various stages of the Work, including any Milestones specified in the Contract Documents;
  - 2. a preliminary Schedule of Submittals; and
  - 3. a preliminary Schedule of Values for all of the Work which includes quantities and prices of items which when added together equal the Contract Price and subdivides the Work into component parts in sufficient detail to serve as the basis for progress payments during performance of the Work. Such prices will include an appropriate amount of overhead and profit applicable to each item of Work.

## 2.06 *Preconstruction Conference; Designation of Authorized Representatives*

- A. Before any Work at the Site is started, a conference attended by Owner, Contractor, Engineer, and others as appropriate will be held to establish a working understanding among the parties as to the Work and to discuss the schedules referred to in Paragraph 2.05.A, procedures for handling Shop Drawings and other submittals, processing Applications for Payment, and maintaining required records.
- B. At this conference Owner and Contractor each shall designate, in writing, a specific individual to act as its authorized representative with respect to the services and responsibilities under the Contract. Such individuals shall have the authority to transmit instructions, receive information, render decisions relative to the Contract, and otherwise act on behalf of each respective party.

## 2.07 *Initial Acceptance of Schedules*

- A. At least 10 days before submission of the first Application for Payment a conference attended by Contractor, Engineer, and others as appropriate will be held to review for acceptability to Engineer as provided below the schedules submitted in accordance with Paragraph 2.05.A. Contractor shall have an additional 10 days to make corrections and adjustments and to complete and resubmit the schedules. No progress payment shall be made to Contractor until acceptable schedules are submitted to Engineer.
  - 1. The Progress Schedule will be acceptable to Engineer if it provides an orderly progression of the Work to completion within the Contract Times. Such acceptance will not impose on

Engineer responsibility for the Progress Schedule, for sequencing, scheduling, or progress of the Work, nor interfere with or relieve Contractor from Contractor's full responsibility therefor.

2. Contractor's Schedule of Submittals will be acceptable to Engineer if it provides a workable arrangement for reviewing and processing the required submittals.
3. Contractor's Schedule of Values will be acceptable to Engineer as to form and substance if it provides a reasonable allocation of the Contract Price to component parts of the Work.

### **ARTICLE 3 – CONTRACT DOCUMENTS: INTENT, AMENDING, REUSE**

#### **3.01 *Intent***

- A. The Contract Documents are complementary; what is required by one is as binding as if required by all.
- B. It is the intent of the Contract Documents to describe a functionally complete project (or part thereof) to be constructed in accordance with the Contract Documents. Any labor, documentation, services, materials, or equipment that reasonably may be inferred from the Contract Documents or from prevailing custom or trade usage as being required to produce the indicated result will be provided whether or not specifically called for, at no additional cost to Owner.
- C. Clarifications and interpretations of the Contract Documents shall be issued by Engineer as provided in Article 9.

#### **3.02 *Reference Standards***

##### **A. ~~Standards, Specifications, Codes, Laws, and Regulations~~**

1. Reference to standards, specifications, manuals, or codes of any technical society, organization, or association, or to Laws or Regulations, whether such reference be specific or by implication, shall mean the standard, specification, manual, code, or Laws or Regulations in effect at the time of opening of Bids (or on the Effective Date of the Agreement if there were no Bids), except as may be otherwise specifically stated in the Contract Documents.
2. No provision of any such standard, specification, manual, or code, or any instruction of a Supplier, shall be effective to change the duties or responsibilities of Owner, Contractor, or Engineer, or any of their subcontractors, consultants, agents, or employees, from those set forth in the Contract Documents. No such provision or instruction shall be effective to assign to Owner, Engineer, or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors, any duty or authority to supervise or direct the performance of the Work or any duty or authority to undertake responsibility inconsistent with the provisions of the Contract Documents.

### 3.03 *Reporting and Resolving Discrepancies*

#### A. *Reporting Discrepancies:*

1. *Contractor's Review of Contract Documents Before Starting Work:* Before undertaking each part of the Work, Contractor shall carefully study and compare the Contract Documents and check and verify pertinent figures therein and all applicable field measurements. Contractor shall promptly report in writing to Engineer any conflict, error, ambiguity, or discrepancy which Contractor discovers, or has actual knowledge of, and shall obtain a written interpretation or clarification from Engineer before proceeding with any Work affected thereby.
2. *Contractor's Review of Contract Documents During Performance of Work:* If, during the performance of the Work, Contractor discovers any conflict, error, ambiguity, or discrepancy within the Contract Documents, or between the Contract Documents and (a) any applicable Law or Regulation, (b) any standard, specification, manual, or code, or (c) any instruction of any Supplier, then Contractor shall promptly report it to Engineer in writing. Contractor shall not proceed with the Work affected thereby (except in an emergency as required by Paragraph 6.16.A) until an amendment or supplement to the Contract Documents has been issued by one of the methods indicated in Paragraph 3.04.
3. Contractor shall not be liable to Owner or Engineer for failure to report any conflict, error, ambiguity, or discrepancy in the Contract Documents unless Contractor had actual knowledge thereof.

#### B. *Resolving Discrepancies:*

1. Except as may be otherwise specifically stated in the Contract Documents, the provisions of the Contract Documents shall take precedence in resolving any conflict, error, ambiguity, or discrepancy between the provisions of the Contract Documents and:
  - a. the provisions of any standard, specification, manual, or code, or the instruction of any Supplier (whether or not specifically incorporated by reference in the Contract Documents); or
  - b. the provisions of any Laws or Regulations applicable to the performance of the Work (unless such an interpretation of the provisions of the Contract Documents would result in violation of such Law or Regulation).

### 3.04 *Amending and Supplementing Contract Documents*

- A. The Contract Documents may be amended to provide for additions, deletions, and revisions in the Work or to modify the terms and conditions thereof by either a Change Order or a Work Change Directive.
- B. The requirements of the Contract Documents may be supplemented, and minor variations and deviations in the Work may be authorized, by one or more of the following ways:

1. A Field Order;
2. Engineer's approval of a Shop Drawing or Sample (subject to the provisions of Paragraph 6.17.D.3); or
3. Engineer's written interpretation or clarification.

3.05 *Reuse of Documents*

- A. Contractor and any Subcontractor or Supplier shall not:
1. have or acquire any title to or ownership rights in any of the Drawings, Specifications, or other documents (or copies of any thereof) prepared by or bearing the seal of Engineer or its consultants, including electronic media editions; or
  2. reuse any such Drawings, Specifications, other documents, or copies thereof on extensions of the Project or any other project without written consent of Owner and Engineer and specific written verification or adaptation by Engineer.
- B. The prohibitions of this Paragraph 3.05 will survive final payment, or termination of the Contract. Nothing herein shall preclude Contractor from retaining copies of the Contract Documents for record purposes.

3.06 *Electronic Data*

- A. Unless otherwise stated in the Supplementary Conditions, the data furnished by Owner or Engineer to Contractor, or by Contractor to Owner or Engineer, that may be relied upon are limited to the printed copies (also known as hard copies). Files in electronic media format of text, data, graphics, or other types are furnished only for the convenience of the receiving party. Any conclusion or information obtained or derived from such electronic files will be at the user's sole risk. If there is a discrepancy between the electronic files and the hard copies, the hard copies govern.
- B. Because data stored in electronic media format can deteriorate or be modified inadvertently or otherwise without authorization of the data's creator, the party receiving electronic files agrees that it will perform acceptance tests or procedures within 60 days, after which the receiving party shall be deemed to have accepted the data thus transferred. Any errors detected within the 60-day acceptance period will be corrected by the transferring party.
- C. When transferring documents in electronic media format, the transferring party makes no representations as to long term compatibility, usability, or readability of documents resulting from the use of software application packages, operating systems, or computer hardware differing from those used by the data's creator.

## ARTICLE 4 – AVAILABILITY OF LANDS; SUBSURFACE AND PHYSICAL CONDITIONS; HAZARDOUS ENVIRONMENTAL CONDITIONS; REFERENCE POINTS

### 4.01 *Availability of Lands*

- A. Owner shall furnish the Site. Owner shall notify Contractor of any encumbrances or restrictions not of general application but specifically related to use of the Site with which Contractor must comply in performing the Work. Owner will obtain in a timely manner and pay for easements for permanent structures or permanent changes in existing facilities. If Contractor and Owner are unable to agree on entitlement to or on the amount or extent, if any, of any adjustment in the Contract Price or Contract Times, or both, as a result of any delay in Owner's furnishing the Site or a part thereof, Contractor may make a Claim therefor as provided in Paragraph 10.05.
- B. Upon reasonable written request, Owner shall furnish Contractor with a current statement of record legal title and legal description of the lands upon which the Work is to be performed and Owner's interest therein as necessary for giving notice of or filing a mechanic's or construction lien against such lands in accordance with applicable Laws and Regulations.
- C. Contractor shall provide for all additional lands and access thereto that may be required for temporary construction facilities or storage of materials and equipment.

### 4.02 *Subsurface and Physical Conditions*

#### A. *Reports and Drawings:* The Supplementary Conditions identify:

1. those reports known to Owner of explorations and tests of subsurface conditions at or contiguous to the Site; and
2. those drawings known to Owner of physical conditions relating to existing surface or subsurface structures at the Site (except Underground Facilities).

#### B. *Limited Reliance by Contractor on Technical Data Authorized:* Contractor may rely upon the accuracy of the "technical data" contained in such reports and drawings, but such reports and drawings are not Contract Documents. Such "technical data" is identified in the Supplementary Conditions. Except for such reliance on such "technical data," Contractor may not rely upon or make any claim against Owner or Engineer, or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors with respect to:

1. the completeness of such reports and drawings for Contractor's purposes, including, but not limited to, any aspects of the means, methods, techniques, sequences, and procedures of construction to be employed by Contractor, and safety precautions and programs incident thereto; or
2. other data, interpretations, opinions, and information contained in such reports or shown or indicated in such drawings; or
3. any Contractor interpretation of or conclusion drawn from any "technical data" or any such other data, interpretations, opinions, or information.

#### 4.03 *Differing Subsurface or Physical Conditions*

A. *Notice:* If Contractor believes that any subsurface or physical condition that is uncovered or revealed either:

1. is of such a nature as to establish that any “technical data” on which Contractor is entitled to rely as provided in Paragraph 4.02 is materially inaccurate; or
2. is of such a nature as to require a change in the Contract Documents; or
3. differs materially from that shown or indicated in the Contract Documents; or
4. is of an unusual nature, and differs materially from conditions ordinarily encountered and generally recognized as inherent in work of the character provided for in the Contract Documents;

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

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

C. *Possible Price and Times Adjustments:*

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

- a. such condition must meet any one or more of the categories described in Paragraph 4.03.A; and
  - b. with respect to Work that is paid for on a unit price basis, any adjustment in Contract Price will be subject to the provisions of Paragraphs 9.07 and 11.03.
2. Contractor shall not be entitled to any adjustment in the Contract Price or Contract Times if:
- a. Contractor knew of the existence of such conditions at the time Contractor made a final commitment to Owner with respect to Contract Price and Contract Times by the submission of a Bid or becoming bound under a negotiated contract; or
  - b. the existence of such condition could reasonably have been discovered or revealed as a result of any examination, investigation, exploration, test, or study of the Site and

contiguous areas required by the Bidding Requirements or Contract Documents to be conducted by or for Contractor prior to Contractor's making such final commitment; or

- c. Contractor failed to give the written notice as required by Paragraph 4.03.A.
3. If Owner and Contractor are unable to agree on entitlement to or on the amount or extent, if any, of any adjustment in the Contract Price or Contract Times, or both, a Claim may be made therefor as provided in Paragraph 10.05. However, neither Owner or Engineer, or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors shall be liable to Contractor for any claims, costs, losses, or damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) sustained by Contractor on or in connection with any other project or anticipated project.

#### 4.04 *Underground Facilities*

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

1. Owner and Engineer shall not be responsible for the accuracy or completeness of any such information or data provided by others; and
2. the cost of all of the following will be included in the Contract Price, and Contractor shall have full responsibility for:
  - a. reviewing and checking all such information and data;
  - b. locating all Underground Facilities shown or indicated in the Contract Documents;
  - c. coordination of the Work with the owners of such Underground Facilities, including Owner, during construction; and
  - d. the safety and protection of all such Underground Facilities and repairing any damage thereto resulting from the Work.

B. *Not Shown or Indicated:*

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

consequences of the existence or location of the Underground Facility. During such time, Contractor shall be responsible for the safety and protection of such Underground Facility.

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

#### 4.05 *Reference Points*

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

#### 4.06 *Hazardous Environmental Condition at Site*

- A. *Reports and Drawings:* The Supplementary Conditions identify those reports and drawings known to Owner relating to Hazardous Environmental Conditions that have been identified at the Site.
- B. *Limited Reliance by Contractor on Technical Data Authorized:* Contractor may rely upon the accuracy of the "technical data" contained in such reports and drawings, but such reports and drawings are not Contract Documents. Such "technical data" is identified in the Supplementary Conditions. Except for such reliance on such "technical data," Contractor may not rely upon or make any claim against Owner or Engineer, or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors with respect to:
  1. the completeness of such reports and drawings for Contractor's purposes, including, but not limited to, any aspects of the means, methods, techniques, sequences and procedures of construction to be employed by Contractor and safety precautions and programs incident thereto; or
  2. other data, interpretations, opinions and information contained in such reports or shown or indicated in such drawings; or
  3. any Contractor interpretation of or conclusion drawn from any "technical data" or any such other data, interpretations, opinions or information.

- C. Contractor shall not be responsible for any Hazardous Environmental Condition uncovered or revealed at the Site which was not shown or indicated in Drawings or Specifications or identified in the Contract Documents to be within the scope of the Work. Contractor shall be responsible for a Hazardous Environmental Condition created with any materials brought to the Site by Contractor, Subcontractors, Suppliers, or anyone else for whom Contractor is responsible.
- D. If Contractor encounters a Hazardous Environmental Condition or if Contractor or anyone for whom Contractor is responsible creates a Hazardous Environmental Condition, Contractor shall immediately: (i) secure or otherwise isolate such condition; (ii) stop all Work in connection with such condition and in any area affected thereby (except in an emergency as required by Paragraph 6.16.A); and (iii) notify Owner and Engineer (and promptly thereafter confirm such notice in writing). Owner shall promptly consult with Engineer concerning the necessity for Owner to retain a qualified expert to evaluate such condition or take corrective action, if any. Promptly after consulting with Engineer, Owner shall take such actions as are necessary to permit Owner to timely obtain required permits and provide Contractor the written notice required by Paragraph 4.06.E.
- E. Contractor shall not be required to resume Work in connection with such condition or in any affected area until after Owner has obtained any required permits related thereto and delivered written notice to Contractor: (i) specifying that such condition and any affected area is or has been rendered safe for the resumption of Work; or (ii) specifying any special conditions under which such Work may be resumed safely. If Owner and Contractor cannot agree as to entitlement to or on the amount or extent, if any, of any adjustment in Contract Price or Contract Times, or both, as a result of such Work stoppage or such special conditions under which Work is agreed to be resumed by Contractor, either party may make a Claim therefor as provided in Paragraph 10.05.
- F. If after receipt of such written notice Contractor does not agree to resume such Work based on a reasonable belief it is unsafe, or does not agree to resume such Work under such special conditions, then Owner may order the portion of the Work that is in the area affected by such condition to be deleted from the Work. If Owner and Contractor cannot agree as to entitlement to or on the amount or extent, if any, of an adjustment in Contract Price or Contract Times as a result of deleting such portion of the Work, then either party may make a Claim therefor as provided in Paragraph 10.05. Owner may have such deleted portion of the Work performed by Owner's own forces or others in accordance with Article 7.
- G. To the fullest extent permitted by Laws and Regulations, Owner shall indemnify and hold harmless Contractor, Subcontractors, and Engineer, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to a Hazardous Environmental Condition, provided that such Hazardous Environmental Condition: (i) was not shown or indicated in the Drawings or Specifications or identified in the Contract Documents to be included within the scope of the Work, and (ii) was not created by Contractor or by anyone for whom Contractor is responsible. Nothing in this Paragraph 4.06.G shall obligate Owner to indemnify any individual or entity from and against the consequences of that individual's or entity's own negligence.

- H. To the fullest extent permitted by Laws and Regulations, Contractor shall indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to a Hazardous Environmental Condition created by Contractor or by anyone for whom Contractor is responsible. Nothing in this Paragraph 4.06.H shall obligate Contractor to indemnify any individual or entity from and against the consequences of that individual's or entity's own negligence.
- I. The provisions of Paragraphs 4.02, 4.03, and 4.04 do not apply to a Hazardous Environmental Condition uncovered or revealed at the Site.

## ARTICLE 5 – BONDS AND INSURANCE

### 5.01 *Performance, Payment, and Other Bonds*

- A. Contractor shall furnish performance and payment bonds, each in an amount at least equal to the Contract Price as security for the faithful performance and payment of all of Contractor's obligations under the Contract Documents. These bonds shall remain in effect until one year after the date when final payment becomes due or until completion of the correction period specified in Paragraph 13.07, whichever is later, except as provided otherwise by Laws or Regulations or by the Contract Documents. Contractor shall also furnish such other bonds as are required by the Contract Documents.
- B. All bonds shall be in the form prescribed by the Contract Documents except as provided otherwise by Laws or Regulations, and shall be executed by such sureties as are named in the list of "Companies Holding Certificates of Authority as Acceptable Sureties on Federal Bonds and as Acceptable Reinsuring Companies" as published in Circular 570 (amended) by the Financial Management Service, Surety Bond Branch, U.S. Department of the Treasury. All bonds signed by an agent or attorney-in-fact must be accompanied by a certified copy of that individual's authority to bind the surety. The evidence of authority shall show that it is effective on the date the agent or attorney-in-fact signed each bond.
- C. If the surety on any bond furnished by Contractor is declared bankrupt or becomes insolvent or its right to do business is terminated in any state where any part of the Project is located or it ceases to meet the requirements of Paragraph 5.01.B, Contractor shall promptly notify Owner and Engineer and shall, within 20 days after the event giving rise to such notification, provide another bond and surety, both of which shall comply with the requirements of Paragraphs 5.01.B and 5.02.

### 5.02 *Licensed Sureties and Insurers*

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

meet such additional requirements and qualifications as may be provided in the Supplementary Conditions.

#### 5.03 *Certificates of Insurance*

- A. Contractor shall deliver to Owner, with copies to each additional insured and loss payee identified in the Supplementary Conditions, certificates of insurance (and other evidence of insurance requested by Owner or any other additional insured) which Contractor is required to purchase and maintain.
- B. Owner shall deliver to Contractor, with copies to each additional insured and loss payee identified in the Supplementary Conditions, certificates of insurance (and other evidence of insurance requested by Contractor or any other additional insured) which Owner is required to purchase and maintain.
- C. Failure of Owner to demand such certificates or other evidence of Contractor's full compliance with these insurance requirements or failure of Owner to identify a deficiency in compliance from the evidence provided shall not be construed as a waiver of Contractor's obligation to maintain such insurance.
- D. Owner does not represent that insurance coverage and limits established in this Contract necessarily will be adequate to protect Contractor.
- E. The insurance and insurance limits required herein shall not be deemed as a limitation on Contractor's liability under the indemnities granted to Owner in the Contract Documents.

#### 5.04 *Contractor's Insurance*

- A. Contractor shall purchase and maintain such insurance as is appropriate for the Work being performed and as will provide protection from claims set forth below which may arise out of or result from Contractor's performance of the Work and Contractor's other obligations under the Contract Documents, whether it is to be performed by Contractor, any Subcontractor or Supplier, or by anyone directly or indirectly employed by any of them to perform any of the Work, or by anyone for whose acts any of them may be liable:
  - 1. claims under workers' compensation, disability benefits, and other similar employee benefit acts;
  - 2. claims for damages because of bodily injury, occupational sickness or disease, or death of Contractor's employees;
  - 3. claims for damages because of bodily injury, sickness or disease, or death of any person other than Contractor's employees;
  - 4. claims for damages insured by reasonably available personal injury liability coverage which are sustained:

- a. by any person as a result of an offense directly or indirectly related to the employment of such person by Contractor, or
  - b. by any other person for any other reason;
5. claims for damages, other than to the Work itself, because of injury to or destruction of tangible property wherever located, including loss of use resulting therefrom; and
  6. claims for damages because of bodily injury or death of any person or property damage arising out of the ownership, maintenance or use of any motor vehicle.
- B. The policies of insurance required by this Paragraph 5.04 shall:
1. with respect to insurance required by Paragraphs 5.04.A.3 through 5.04.A.6 inclusive, be written on an occurrence basis, include as additional insureds (subject to any customary exclusion regarding professional liability) Owner and Engineer, and any other individuals or entities identified in the Supplementary Conditions, all of whom shall be listed as additional insureds, and include coverage for the respective officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of all such additional insureds, and the insurance afforded to these additional insureds shall provide primary coverage for all claims covered thereby;
  2. include at least the specific coverages and be written for not less than the limits of liability provided in the Supplementary Conditions or required by Laws or Regulations, whichever is greater;
  3. include contractual liability insurance covering Contractor's indemnity obligations under Paragraphs 6.11 and 6.20;
  4. contain a provision or endorsement that the coverage afforded will not be canceled, materially changed or renewal refused until at least 30 days prior written notice has been given to Owner and Contractor and to each other additional insured identified in the Supplementary Conditions to whom a certificate of insurance has been issued (and the certificates of insurance furnished by the Contractor pursuant to Paragraph 5.03 will so provide);
  5. remain in effect at least until final payment and at all times thereafter when Contractor may be correcting, removing, or replacing defective Work in accordance with Paragraph 13.07; and
  6. include completed operations coverage:
    - a. Such insurance shall remain in effect for two years after final payment.
    - b. Contractor shall furnish Owner and each other additional insured identified in the Supplementary Conditions, to whom a certificate of insurance has been issued, evidence satisfactory to Owner and any such additional insured of continuation of such insurance at final payment and one year thereafter.

5.05 *Owner's Liability Insurance*

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

5.06 *Property Insurance*

- A. Unless otherwise provided in the Supplementary Conditions, Owner shall purchase and maintain property insurance upon the Work at the Site in the amount of the full replacement cost thereof (subject to such deductible amounts as may be provided in the Supplementary Conditions or required by Laws and Regulations). This insurance shall:

1. include the interests of Owner, Contractor, Subcontractors, and Engineer, and any other individuals or entities identified in the Supplementary Conditions, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them, each of whom is deemed to have an insurable interest and shall be listed as a loss payee;
2. be written on a Builder's Risk "all-risk" policy form that shall at least include insurance for physical loss or damage to the Work, temporary buildings, falsework, and materials and equipment in transit, and shall insure against at least the following perils or causes of loss: fire, lightning, extended coverage, theft, vandalism and malicious mischief, earthquake, collapse, debris removal, demolition occasioned by enforcement of Laws and Regulations, water damage (other than that caused by flood), and such other perils or causes of loss as may be specifically required by the Supplementary Conditions.

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

4. cover materials and equipment stored at the Site or at another location that was agreed to in writing by Owner prior to being incorporated in the Work, provided that such materials and equipment have been included in an Application for Payment recommended by Engineer;
5. allow for partial utilization of the Work by Owner;
6. include testing and startup; and
7. be maintained in effect until final payment is made unless otherwise agreed to in writing by Owner, Contractor, and Engineer with 30 days written notice to each other loss payee to whom a certificate of insurance has been issued.

- B. Owner shall purchase and maintain such equipment breakdown insurance or additional property insurance as may be required by the Supplementary Conditions or Laws and Regulations which will include the interests of Owner, Contractor, Subcontractors, and Engineer, and any other individuals or entities identified in the Supplementary Conditions, and the officers, directors,

members, partners, employees, agents, consultants and subcontractors of each and any of them, each of whom is deemed to have an insurable interest and shall be listed as a loss payee.

- C. All the policies of insurance (and the certificates or other evidence thereof) required to be purchased and maintained in accordance with this Paragraph 5.06 will contain a provision or endorsement that the coverage afforded will not be canceled or materially changed or renewal refused until at least 30 days prior written notice has been given to Owner and Contractor and to each other loss payee to whom a certificate of insurance has been issued and will contain waiver provisions in accordance with Paragraph 5.07.
- D. Owner shall not be responsible for purchasing and maintaining any property insurance specified in this Paragraph 5.06 to protect the interests of Contractor, Subcontractors, or others in the Work to the extent of any deductible amounts that are identified in the Supplementary Conditions. The risk of loss within such identified deductible amount will be borne by Contractor, Subcontractors, or others suffering any such loss, and if any of them wishes property insurance coverage within the limits of such amounts, each may purchase and maintain it at the purchaser's own expense.
- E. If Contractor requests in writing that other special insurance be included in the property insurance policies provided under this Paragraph 5.06, Owner shall, if possible, include such insurance, and the cost thereof will be charged to Contractor by appropriate Change Order. Prior to commencement of the Work at the Site, Owner shall in writing advise Contractor whether or not such other insurance has been procured by Owner.

#### 5.07 *Waiver of Rights*

- A. Owner and Contractor intend that all policies purchased in accordance with Paragraph 5.06 will protect Owner, Contractor, Subcontractors, and Engineer, and all other individuals or entities identified in the Supplementary Conditions as loss payees (and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them) in such policies and will provide primary coverage for all losses and damages caused by the perils or causes of loss covered thereby. All such policies shall contain provisions to the effect that in the event of payment of any loss or damage the insurers will have no rights of recovery against any of the insureds or loss payees thereunder. Owner and Contractor waive all rights against each other and their respective officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them for all losses and damages caused by, arising out of or resulting from any of the perils or causes of loss covered by such policies and any other property insurance applicable to the Work; and, in addition, waive all such rights against Subcontractors and Engineer, and all other individuals or entities identified in the Supplementary Conditions as loss payees (and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them) under such policies for losses and damages so caused. None of the above waivers shall extend to the rights that any party making such waiver may have to the proceeds of insurance held by Owner as trustee or otherwise payable under any policy so issued.
- B. Owner waives all rights against Contractor, Subcontractors, and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them for:

1. loss due to business interruption, loss of use, or other consequential loss extending beyond direct physical loss or damage to Owner's property or the Work caused by, arising out of, or resulting from fire or other perils whether or not insured by Owner; and
  2. loss or damage to the completed Project or part thereof caused by, arising out of, or resulting from fire or other insured peril or cause of loss covered by any property insurance maintained on the completed Project or part thereof by Owner during partial utilization pursuant to Paragraph 14.05, after Substantial Completion pursuant to Paragraph 14.04, or after final payment pursuant to Paragraph 14.07.
- C. Any insurance policy maintained by Owner covering any loss, damage or consequential loss referred to in Paragraph 5.07.B shall contain provisions to the effect that in the event of payment of any such loss, damage, or consequential loss, the insurers will have no rights of recovery against Contractor, Subcontractors, or Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them.

#### 5.08 *Receipt and Application of Insurance Proceeds*

- A. Any insured loss under the policies of insurance required by Paragraph 5.06 will be adjusted with Owner and made payable to Owner as fiduciary for the loss payees, as their interests may appear, subject to the requirements of any applicable mortgage clause and of Paragraph 5.08.B. Owner shall deposit in a separate account any money so received and shall distribute it in accordance with such agreement as the parties in interest may reach. If no other special agreement is reached, the damaged Work shall be repaired or replaced, the moneys so received applied on account thereof, and the Work and the cost thereof covered by an appropriate Change Order.
- B. Owner as fiduciary shall have power to adjust and settle any loss with the insurers unless one of the parties in interest shall object in writing within 15 days after the occurrence of loss to Owner's exercise of this power. If such objection be made, Owner as fiduciary shall make settlement with the insurers in accordance with such agreement as the parties in interest may reach. If no such agreement among the parties in interest is reached, Owner as fiduciary shall adjust and settle the loss with the insurers and, if required in writing by any party in interest, Owner as fiduciary shall give bond for the proper performance of such duties.

#### 5.09 *Acceptance of Bonds and Insurance; Option to Replace*

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

interests at the expense of the party who was required to provide such coverage, and a Change Order shall be issued to adjust the Contract Price accordingly.

5.10 *Partial Utilization, Acknowledgment of Property Insurer*

- A. If Owner finds it necessary to occupy or use a portion or portions of the Work prior to Substantial Completion of all the Work as provided in Paragraph 14.05, no such use or occupancy shall commence before the insurers providing the property insurance pursuant to Paragraph 5.06 have acknowledged notice thereof and in writing effected any changes in coverage necessitated thereby. The insurers providing the property insurance shall consent by endorsement on the policy or policies, but the property insurance shall not be canceled or permitted to lapse on account of any such partial use or occupancy.

**ARTICLE 6 – CONTRACTOR’S RESPONSIBILITIES**

6.01 *Supervision and Superintendence*

- A. Contractor shall supervise, inspect, and direct the Work competently and efficiently, devoting such attention thereto and applying such skills and expertise as may be necessary to perform the Work in accordance with the Contract Documents. Contractor shall be solely responsible for the means, methods, techniques, sequences, and procedures of construction. Contractor shall not be responsible for the negligence of Owner or Engineer in the design or specification of a specific means, method, technique, sequence, or procedure of construction which is shown or indicated in and expressly required by the Contract Documents.
- B. At all times during the progress of the Work, Contractor shall assign a competent resident superintendent who shall not be replaced without written notice to Owner and Engineer except under extraordinary circumstances.

6.02 *Labor, Working Hours*

- A. Contractor shall provide competent, suitably qualified personnel to survey and lay out the Work and perform construction as required by the Contract Documents. Contractor shall at all times maintain good discipline and order at the Site.
- B. Except as otherwise required for the safety or protection of persons or the Work or property at the Site or adjacent thereto, and except as otherwise stated in the Contract Documents, all Work at the Site shall be performed during regular working hours. Contractor will not permit the performance of Work on a Saturday, Sunday, or any legal holiday without Owner’s written consent (which will not be unreasonably withheld) given after prior written notice to Engineer.

6.03 *Services, Materials, and Equipment*

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

**REFERENCE ONLY**

- B. All materials and equipment incorporated into the Work shall be as specified or, if not specified, shall be of good quality and new, except as otherwise provided in the Contract Documents. All special warranties and guarantees required by the Specifications shall expressly run to the benefit of Owner. If required by Engineer, Contractor shall furnish satisfactory evidence (including reports of required tests) as to the source, kind, and quality of materials and equipment.
- C. All materials and equipment shall be stored, applied, installed, connected, erected, protected, used, cleaned, and conditioned in accordance with instructions of the applicable Supplier, except as otherwise may be provided in the Contract Documents.

#### 6.04 *Progress Schedule*

- A. Contractor shall adhere to the Progress Schedule established in accordance with Paragraph 2.07 as it may be adjusted from time to time as provided below.
  - 1. Contractor shall submit to Engineer for acceptance (to the extent indicated in Paragraph 2.07) proposed adjustments in the Progress Schedule that will not result in changing the Contract Times. Such adjustments will comply with any provisions of the General Requirements applicable thereto.
  - 2. Proposed adjustments in the Progress Schedule that will change the Contract Times shall be submitted in accordance with the requirements of Article 12. Adjustments in Contract Times may only be made by a Change Order.

#### 6.05 *Substitutes and "Or-Equals"*

- A. Whenever an item of material or equipment is specified or described in the Contract Documents by using the name of a proprietary item or the name of a particular Supplier, the specification or description is intended to establish the type, function, appearance, and quality required. Unless the specification or description contains or is followed by words reading that no like, equivalent, or "or-equal" item or no substitution is permitted, other items of material or equipment or material or equipment of other Suppliers may be submitted to Engineer for review under the circumstances described below.
  - 1. *"Or-Equal" Items:* If in Engineer's sole discretion an item of material or equipment proposed by Contractor is functionally equal to that named and sufficiently similar so that no change in related Work will be required, it may be considered by Engineer as an "or-equal" item, in which case review and approval of the proposed item may, in Engineer's sole discretion, be accomplished without compliance with some or all of the requirements for approval of proposed substitute items. For the purposes of this Paragraph 6.05.A.1, a proposed item of material or equipment will be considered functionally equal to an item so named if:
    - a. in the exercise of reasonable judgment Engineer determines that:
      - 1) it is at least equal in materials of construction, quality, durability, appearance, strength, and design characteristics;

- 2) it will reliably perform at least equally well the function and achieve the results imposed by the design concept of the completed Project as a functioning whole; and
  - 3) it has a proven record of performance and availability of responsive service.
- b. Contractor certifies that, if approved and incorporated into the Work:
- 1) there will be no increase in cost to the Owner or increase in Contract Times; and
  - 2) it will conform substantially to the detailed requirements of the item named in the Contract Documents.

2. *Substitute Items:*

- a. If in Engineer's sole discretion an item of material or equipment proposed by Contractor does not qualify as an "or-equal" item under Paragraph 6.05.A.1, it will be considered a proposed substitute item.
- b. Contractor shall submit sufficient information as provided below to allow Engineer to determine if the item of material or equipment proposed is essentially equivalent to that named and an acceptable substitute therefor. Requests for review of proposed substitute items of material or equipment will not be accepted by Engineer from anyone other than Contractor.
- c. The requirements for review by Engineer will be as set forth in Paragraph 6.05.A.2.d, as supplemented by the General Requirements, and as Engineer may decide is appropriate under the circumstances.

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

- 1) shall certify that the proposed substitute item will:
  - a) perform adequately the functions and achieve the results called for by the general design,
  - b) be similar in substance to that specified, and
  - c) be suited to the same use as that specified;
- 2) will state:
  - a) the extent, if any, to which the use of the proposed substitute item will prejudice Contractor's achievement of Substantial Completion on time,
  - b) whether use of the proposed substitute item in the Work will require a change in any of the Contract Documents (or in the provisions of any other direct contract with Owner for other work on the Project) to adapt the design to the proposed substitute item, and

- c) whether incorporation or use of the proposed substitute item in connection with the Work is subject to payment of any license fee or royalty;
  - 3) will identify:
    - a) all variations of the proposed substitute item from that specified, and
    - b) available engineering, sales, maintenance, repair, and replacement services; and
  - 4) shall contain an itemized estimate of all costs or credits that will result directly or indirectly from use of such substitute item, including costs of redesign and claims of other contractors affected by any resulting change.
- B. *Substitute Construction Methods or Procedures:* If a specific means, method, technique, sequence, or procedure of construction is expressly required by the Contract Documents, Contractor may furnish or utilize a substitute means, method, technique, sequence, or procedure of construction approved by Engineer. Contractor shall submit sufficient information to allow Engineer, in Engineer's sole discretion, to determine that the substitute proposed is equivalent to that expressly called for by the Contract Documents. The requirements for review by Engineer will be similar to those provided in Paragraph 6.05.A.2.
- C. *Engineer's Evaluation:* Engineer will be allowed a reasonable time within which to evaluate each proposal or submittal made pursuant to Paragraphs 6.05.A and 6.05.B. Engineer may require Contractor to furnish additional data about the proposed substitute item. Engineer will be the sole judge of acceptability. No "or equal" or substitute will be ordered, installed or utilized until Engineer's review is complete, which will be evidenced by a Change Order in the case of a substitute and an approved Shop Drawing for an "or equal." Engineer will advise Contractor in writing of any negative determination.
- D. *Special Guarantee:* Owner may require Contractor to furnish at Contractor's expense a special performance guarantee or other surety with respect to any substitute.
- E. *Engineer's Cost Reimbursement:* Engineer will record Engineer's costs in evaluating a substitute proposed or submitted by Contractor pursuant to Paragraphs 6.05.A.2 and 6.05.B. Whether or not Engineer approves a substitute so proposed or submitted by Contractor, Contractor shall reimburse Owner for the reasonable charges of Engineer for evaluating each such proposed substitute. Contractor shall also reimburse Owner for the reasonable charges of Engineer for making changes in the Contract Documents (or in the provisions of any other direct contract with Owner) resulting from the acceptance of each proposed substitute.
- F. *Contractor's Expense:* Contractor shall provide all data in support of any proposed substitute or "or-equal" at Contractor's expense.

#### 6.06 *Concerning Subcontractors, Suppliers, and Others*

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

required to employ any Subcontractor, Supplier, or other individual or entity to furnish or perform any of the Work against whom Contractor has reasonable objection.

- B. If the Supplementary Conditions require the identity of certain Subcontractors, Suppliers, or other individuals or entities to be submitted to Owner in advance for acceptance by Owner by a specified date prior to the Effective Date of the Agreement, and if Contractor has submitted a list thereof in accordance with the Supplementary Conditions, Owner's acceptance (either in writing or by failing to make written objection thereto by the date indicated for acceptance or objection in the Bidding Documents or the Contract Documents) of any such Subcontractor, Supplier, or other individual or entity so identified may be revoked on the basis of reasonable objection after due investigation. Contractor shall submit an acceptable replacement for the rejected Subcontractor, Supplier, or other individual or entity, and the Contract Price will be adjusted by the difference in the cost occasioned by such replacement, and an appropriate Change Order will be issued. No acceptance by Owner of any such Subcontractor, Supplier, or other individual or entity, whether initially or as a replacement, shall constitute a waiver of any right of Owner or Engineer to reject defective Work.
- C. Contractor shall be fully responsible to Owner and Engineer for all acts and omissions of the Subcontractors, Suppliers, and other individuals or entities performing or furnishing any of the Work just as Contractor is responsible for Contractor's own acts and omissions. Nothing in the Contract Documents:
1. shall create for the benefit of any such Subcontractor, Supplier, or other individual or entity any contractual relationship between Owner or Engineer and any such Subcontractor, Supplier or other individual or entity; nor
  2. shall create any obligation on the part of Owner or Engineer to pay or to see to the payment of any moneys due any such Subcontractor, Supplier, or other individual or entity except as may otherwise be required by Laws and Regulations.
- D. Contractor shall be solely responsible for scheduling and coordinating the Work of Subcontractors, Suppliers, and other individuals or entities performing or furnishing any of the Work under a direct or indirect contract with Contractor.
- E. Contractor shall require all Subcontractors, Suppliers, and such other individuals or entities performing or furnishing any of the Work to communicate with Engineer through Contractor.
- F. The divisions and sections of the Specifications and the identifications of any Drawings shall not control Contractor in dividing the Work among Subcontractors or Suppliers or delineating the Work to be performed by any specific trade.
- G. All Work performed for Contractor by a Subcontractor or Supplier will be pursuant to an appropriate agreement between Contractor and the Subcontractor or Supplier which specifically binds the Subcontractor or Supplier to the applicable terms and conditions of the Contract Documents for the benefit of Owner and Engineer. Whenever any such agreement is with a Subcontractor or Supplier who is listed as a loss payee on the property insurance provided in Paragraph 5.06, the agreement between the Contractor and the Subcontractor or Supplier will contain provisions whereby the Subcontractor or Supplier waives all rights against Owner,

Contractor, Engineer, and all other individuals or entities identified in the Supplementary Conditions to be listed as insureds or loss payees (and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them) for all losses and damages caused by, arising out of, relating to, or resulting from any of the perils or causes of loss covered by such policies and any other property insurance applicable to the Work. If the insurers on any such policies require separate waiver forms to be signed by any Subcontractor or Supplier, Contractor will obtain the same.

#### 6.07 *Patent Fees and Royalties*

- A. Contractor shall pay all license fees and royalties and assume all costs incident to the use in the performance of the Work or the incorporation in the Work of any invention, design, process, product, or device which is the subject of patent rights or copyrights held by others. If a particular invention, design, process, product, or device is specified in the Contract Documents for use in the performance of the Work and if, to the actual knowledge of Owner or Engineer, its use is subject to patent rights or copyrights calling for the payment of any license fee or royalty to others, the existence of such rights shall be disclosed by Owner in the Contract Documents.
- B. To the fullest extent permitted by Laws and Regulations, Owner shall indemnify and hold harmless Contractor, and its officers, directors, members, partners, employees, agents, consultants, and subcontractors from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals, and all court or arbitration or other dispute resolution costs) arising out of or relating to any infringement of patent rights or copyrights incident to the use in the performance of the Work or resulting from the incorporation in the Work of any invention, design, process, product, or device specified in the Contract Documents, but not identified as being subject to payment of any license fee or royalty to others required by patent rights or copyrights.
- C. To the fullest extent permitted by Laws and Regulations, Contractor shall indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to any infringement of patent rights or copyrights incident to the use in the performance of the Work or resulting from the incorporation in the Work of any invention, design, process, product, or device not specified in the Contract Documents.

#### 6.08 *Permits*

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

## 6.09 *Laws and Regulations*

- A. Contractor shall give all notices required by and shall comply with all Laws and Regulations applicable to the performance of the Work. Except where otherwise expressly required by applicable Laws and Regulations, neither Owner nor Engineer shall be responsible for monitoring Contractor's compliance with any Laws or Regulations.
- B. If Contractor performs any Work knowing or having reason to know that it is contrary to Laws or Regulations, Contractor shall bear all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such Work. However, it shall not be Contractor's responsibility to make certain that the Specifications and Drawings are in accordance with Laws and Regulations, but this shall not relieve Contractor of Contractor's obligations under Paragraph 3.03.
- C. Changes in Laws or Regulations not known at the time of opening of Bids (or, on the Effective Date of the Agreement if there were no Bids) having an effect on the cost or time of performance of the Work shall be the subject of an adjustment in Contract Price or Contract Times. If Owner and Contractor are unable to agree on entitlement to or on the amount or extent, if any, of any such adjustment, a Claim may be made therefor as provided in Paragraph 10.05.

## 6.10 *Taxes*

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

## 6.11 *Use of Site and Other Areas*

### A. *Limitation on Use of Site and Other Areas:*

1. Contractor shall confine construction equipment, the storage of materials and equipment, and the operations of workers to the Site and other areas permitted by Laws and Regulations, and shall not unreasonably encumber the Site and other areas with construction equipment or other materials or equipment. Contractor shall assume full responsibility for any damage to any such land or area, or to the owner or occupant thereof, or of any adjacent land or areas resulting from the performance of the Work.
2. Should any claim be made by any such owner or occupant because of the performance of the Work, Contractor shall promptly settle with such other party by negotiation or otherwise resolve the claim by arbitration or other dispute resolution proceeding or at law.
3. To the fullest extent permitted by Laws and Regulations, Contractor shall indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to any claim or action, legal or equitable, brought

by any such owner or occupant against Owner, Engineer, or any other party indemnified hereunder to the extent caused by or based upon Contractor's performance of the Work.

- B. *Removal of Debris During Performance of the Work:* During the progress of the Work Contractor shall keep the Site and other areas free from accumulations of waste materials, rubbish, and other debris. Removal and disposal of such waste materials, rubbish, and other debris shall conform to applicable Laws and Regulations.
- C. *Cleaning:* Prior to Substantial Completion of the Work Contractor shall clean the Site and the Work and make it ready for utilization by Owner. At the completion of the Work Contractor shall remove from the Site all tools, appliances, construction equipment and machinery, and surplus materials and shall restore to original condition all property not designated for alteration by the Contract Documents.
- D. *Loading Structures:* Contractor shall not load nor permit any part of any structure to be loaded in any manner that will endanger the structure, nor shall Contractor subject any part of the Work or adjacent property to stresses or pressures that will endanger it.

#### 6.12 *Record Documents*

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

#### 6.13 *Safety and Protection*

- A. Contractor shall be solely responsible for initiating, maintaining and supervising all safety precautions and programs in connection with the Work. Such responsibility does not relieve Subcontractors of their responsibility for the safety of persons or property in the performance of their work, nor for compliance with applicable safety Laws and Regulations. Contractor shall take all necessary precautions for the safety of, and shall provide the necessary protection to prevent damage, injury or loss to:
  - 1. all persons on the Site or who may be affected by the Work;
  - 2. all the Work and materials and equipment to be incorporated therein, whether in storage on or off the Site; and
  - 3. other property at the Site or adjacent thereto, including trees, shrubs, lawns, walks, pavements, roadways, structures, utilities, and Underground Facilities not designated for removal, relocation, or replacement in the course of construction.
- B. Contractor shall comply with all applicable Laws and Regulations relating to the safety of persons or property, or to the protection of persons or property from damage, injury, or loss; and

shall erect and maintain all necessary safeguards for such safety and protection. Contractor shall notify owners of adjacent property and of Underground Facilities and other utility owners when prosecution of the Work may affect them, and shall cooperate with them in the protection, removal, relocation, and replacement of their property.

- C. Contractor shall comply with the applicable requirements of Owner's safety programs, if any. The Supplementary Conditions identify any Owner's safety programs that are applicable to the Work.
- D. Contractor shall inform Owner and Engineer of the specific requirements of Contractor's safety program with which Owner's and Engineer's employees and representatives must comply while at the Site.
- E. All damage, injury, or loss to any property referred to in Paragraph 6.13.A.2 or 6.13.A.3 caused, directly or indirectly, in whole or in part, by Contractor, any Subcontractor, Supplier, or any other individual or entity directly or indirectly employed by any of them to perform any of the Work, or anyone for whose acts any of them may be liable, shall be remedied by Contractor (except damage or loss attributable to the fault of Drawings or Specifications or to the acts or omissions of Owner or Engineer or anyone employed by any of them, or anyone for whose acts any of them may be liable, and not attributable, directly or indirectly, in whole or in part, to the fault or negligence of Contractor or any Subcontractor, Supplier, or other individual or entity directly or indirectly employed by any of them).
- F. Contractor's duties and responsibilities for safety and for protection of the Work shall continue until such time as all the Work is completed and Engineer has issued a notice to Owner and Contractor in accordance with Paragraph 14.07.B that the Work is acceptable (except as otherwise expressly provided in connection with Substantial Completion).

#### 6.14 *Safety Representative*

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

#### 6.15 *Hazard Communication Programs*

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

#### 6.16 *Emergencies*

- A. In emergencies affecting the safety or protection of persons or the Work or property at the Site or adjacent thereto, Contractor is obligated to act to prevent threatened damage, injury, or loss. Contractor shall give Engineer prompt written notice if Contractor believes that any significant changes in the Work or variations from the Contract Documents have been caused thereby or are required as a result thereof. If Engineer determines that a change in the Contract Documents is

required because of the action taken by Contractor in response to such an emergency, a Work Change Directive or Change Order will be issued.

#### 6.17 *Shop Drawings and Samples*

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

##### 1. *Shop Drawings:*

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

##### 2. *Samples:*

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

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

##### C. *Submittal Procedures:*

##### 1. Before submitting each Shop Drawing or Sample, Contractor shall have:

- a. reviewed and coordinated each Shop Drawing or Sample with other Shop Drawings and Samples and with the requirements of the Work and the Contract Documents;
- b. determined and verified all field measurements, quantities, dimensions, specified performance and design criteria, installation requirements, materials, catalog numbers, and similar information with respect thereto;
- c. determined and verified the suitability of all materials offered with respect to the indicated application, fabrication, shipping, handling, storage, assembly, and installation pertaining to the performance of the Work; and
- d. determined and verified all information relative to Contractor's responsibilities for means, methods, techniques, sequences, and procedures of construction, and safety precautions and programs incident thereto.

2. Each submittal shall bear a stamp or specific written certification that Contractor has satisfied Contractor's obligations under the Contract Documents with respect to Contractor's review and approval of that submittal.
3. With each submittal, Contractor shall give Engineer specific written notice of any variations that the Shop Drawing or Sample may have from the requirements of the Contract Documents. This notice shall be both a written communication separate from the Shop Drawings or Sample submittal; and, in addition, by a specific notation made on each Shop Drawing or Sample submitted to Engineer for review and approval of each such variation.

D. *Engineer's Review:*

1. Engineer will provide timely review of Shop Drawings and Samples in accordance with the Schedule of Submittals acceptable to Engineer. Engineer's review and approval will be only to determine if the items covered by the submittals will, after installation or incorporation in the Work, conform to the information given in the Contract Documents and be compatible with the design concept of the completed Project as a functioning whole as indicated by the Contract Documents.
2. Engineer's review and approval will not extend to means, methods, techniques, sequences, or procedures of construction (except where a particular means, method, technique, sequence, or procedure of construction is specifically and expressly called for by the Contract Documents) or to safety precautions or programs incident thereto. The review and approval of a separate item as such will not indicate approval of the assembly in which the item functions.
3. Engineer's review and approval shall not relieve Contractor from responsibility for any variation from the requirements of the Contract Documents unless Contractor has complied with the requirements of Paragraph 6.17.C.3 and Engineer has given written approval of each such variation by specific written notation thereof incorporated in or accompanying the Shop Drawing or Sample. Engineer's review and approval shall not relieve Contractor from responsibility for complying with the requirements of Paragraph 6.17.C.1.

E. *Resubmittal Procedures:*

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

6.18 *Continuing the Work*

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

6.19 *Contractor's General Warranty and Guarantee*

- A. Contractor warrants and guarantees to Owner that all Work will be in accordance with the Contract Documents and will not be defective. Engineer and its officers, directors, members, partners, employees, agents, consultants, and subcontractors shall be entitled to rely on representation of Contractor's warranty and guarantee.
- B. Contractor's warranty and guarantee hereunder excludes defects or damage caused by:
1. abuse, modification, or improper maintenance or operation by persons other than Contractor, Subcontractors, Suppliers, or any other individual or entity for whom Contractor is responsible; or
  2. normal wear and tear under normal usage.
- C. Contractor's obligation to perform and complete the Work in accordance with the Contract Documents shall be absolute. None of the following will constitute an acceptance of Work that is not in accordance with the Contract Documents or a release of Contractor's obligation to perform the Work in accordance with the Contract Documents:
1. observations by Engineer;
  2. recommendation by Engineer or payment by Owner of any progress or final payment;
  3. the issuance of a certificate of Substantial Completion by Engineer or any payment related thereto by Owner;
  4. use or occupancy of the Work or any part thereof by Owner;
  5. any review and approval of a Shop Drawing or Sample submittal or the issuance of a notice of acceptability by Engineer;
  6. any inspection, test, or approval by others; or
  7. any correction of defective Work by Owner.

REFERENCE ONLY

6.20 *Indemnification*

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

- B. In any and all claims against Owner or Engineer or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors by any employee (or the survivor or personal representative of such employee) of Contractor, any Subcontractor, any Supplier, or any individual or entity directly or indirectly employed by any of them to perform any of the Work, or anyone for whose acts any of them may be liable, the indemnification obligation under Paragraph 6.20.A shall not be limited in any way by any limitation on the amount or type of damages, compensation, or benefits payable by or for Contractor or any such Subcontractor, Supplier, or other individual or entity under workers' compensation acts, disability benefit acts, or other employee benefit acts.
- C. The indemnification obligations of Contractor under Paragraph 6.20.A shall not extend to the liability of Engineer and Engineer's officers, directors, members, partners, employees, agents, consultants and subcontractors arising out of:
  - 1. the preparation or approval of, or the failure to prepare or approve maps, Drawings, opinions, reports, surveys, Change Orders, designs, or Specifications; or
  - 2. giving directions or instructions, or failing to give them, if that is the primary cause of the injury or damage.

6.21 *Delegation of Professional Design Services*

- A. Contractor will not be required to provide professional design services unless such services are specifically required by the Contract Documents for a portion of the Work or unless such services are required to carry out Contractor's responsibilities for construction means, methods, techniques, sequences and procedures. Contractor shall not be required to provide professional services in violation of applicable law.
- B. If professional design services or certifications by a design professional related to systems, materials or equipment are specifically required of Contractor by the Contract Documents, Owner and Engineer will specify all performance and design criteria that such services must satisfy. Contractor shall cause such services or certifications to be provided by a properly licensed professional, whose signature and seal shall appear on all drawings, calculations, specifications, certifications, Shop Drawings and other submittals prepared by such professional. Shop Drawings and other submittals related to the Work designed or certified by such professional, if prepared by others, shall bear such professional's written approval when submitted to Engineer.
- C. Owner and Engineer shall be entitled to rely upon the adequacy, accuracy and completeness of the services, certifications or approvals performed by such design professionals, provided Owner and Engineer have specified to Contractor all performance and design criteria that such services must satisfy.
- D. Pursuant to this Paragraph 6.21, Engineer's review and approval of design calculations and design drawings will be only for the limited purpose of checking for conformance with performance and design criteria given and the design concept expressed in the Contract Documents. Engineer's review and approval of Shop Drawings and other submittals (except design calculations and design drawings) will be only for the purpose stated in Paragraph 6.17.D.1.

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

## ARTICLE 7 – OTHER WORK AT THE SITE

### 7.01 *Related Work at Site*

- A. Owner may perform other work related to the Project at the Site with Owner's employees, or through other direct contracts therefor, or have other work performed by utility owners. If such other work is not noted in the Contract Documents, then:
1. written notice thereof will be given to Contractor prior to starting any such other work; and
  2. if Owner and Contractor are unable to agree on entitlement to or on the amount or extent, if any, of any adjustment in the Contract Price or Contract Times that should be allowed as a result of such other work, a Claim may be made therefor as provided in Paragraph 10.05.
- B. Contractor shall afford each other contractor who is a party to such a direct contract, each utility owner, and Owner, if Owner is performing other work with Owner's employees, proper and safe access to the Site, provide a reasonable opportunity for the introduction and storage of materials and equipment and the execution of such other work, and properly coordinate the Work with theirs. Contractor shall do all cutting, fitting, and patching of the Work that may be required to properly connect or otherwise make its several parts come together and properly integrate with such other work. Contractor shall not endanger any work of others by cutting, excavating, or otherwise altering such work; provided, however, that Contractor may cut or alter others' work with the written consent of Engineer and the others whose work will be affected. The duties and responsibilities of Contractor under this Paragraph are for the benefit of such utility owners and other contractors to the extent that there are comparable provisions for the benefit of Contractor in said direct contracts between Owner and such utility owners and other contractors.
- C. If the proper execution or results of any part of Contractor's Work depends upon work performed by others under this Article 7, Contractor shall inspect such other work and promptly report to Engineer in writing any delays, defects, or deficiencies in such other work that render it unavailable or unsuitable for the proper execution and results of Contractor's Work. Contractor's failure to so report will constitute an acceptance of such other work as fit and proper for integration with Contractor's Work except for latent defects and deficiencies in such other work.

### 7.02 *Coordination*

- A. If Owner intends to contract with others for the performance of other work on the Project at the Site, the following will be set forth in Supplementary Conditions:
1. the individual or entity who will have authority and responsibility for coordination of the activities among the various contractors will be identified;
  2. the specific matters to be covered by such authority and responsibility will be itemized; and
  3. the extent of such authority and responsibilities will be provided.

- B. Unless otherwise provided in the Supplementary Conditions, Owner shall have sole authority and responsibility for such coordination.

7.03 *Legal Relationships*

- A. Paragraphs 7.01.A and 7.02 are not applicable for utilities not under the control of Owner.
- B. Each other direct contract of Owner under Paragraph 7.01.A shall provide that the other contractor is liable to Owner and Contractor for the reasonable direct delay and disruption costs incurred by Contractor as a result of the other contractor's wrongful actions or inactions.
- C. Contractor shall be liable to Owner and any other contractor under direct contract to Owner for the reasonable direct delay and disruption costs incurred by such other contractor as a result of Contractor's wrongful action or inactions.

**ARTICLE 8 – OWNER'S RESPONSIBILITIES**

8.01 *Communications to Contractor*

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

8.02 *Replacement of Engineer*

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

8.03 *Furnish Data*

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

8.04 *Pay When Due*

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

8.05 *Lands and Easements; Reports and Tests*

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

8.06 *Insurance*

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

8.07 *Change Orders*

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

8.08 *Inspections, Tests, and Approvals*

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

8.09 *Limitations on Owner's Responsibilities*

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

8.10 *Undisclosed Hazardous Environmental Condition*

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

8.11 *Evidence of Financial Arrangements*

A. Upon request of Contractor, Owner shall furnish Contractor reasonable evidence that financial arrangements have been made to satisfy Owner's obligations under the Contract Documents.

8.12 *Compliance with Safety Program*

A. While at the Site, Owner's employees and representatives shall comply with the specific applicable requirements of Contractor's safety programs of which Owner has been informed pursuant to Paragraph 6.13.D.

**ARTICLE 9 – ENGINEER'S STATUS DURING CONSTRUCTION**

9.01 *Owner's Representative*

A. Engineer will be Owner's representative during the construction period. The duties and responsibilities and the limitations of authority of Engineer as Owner's representative during construction are set forth in the Contract Documents.

9.02 *Visits to Site*

A. Engineer will make visits to the Site at intervals appropriate to the various stages of construction as Engineer deems necessary in order to observe as an experienced and qualified design professional the progress that has been made and the quality of the various aspects of Contractor's executed Work. Based on information obtained during such visits and observations, Engineer, for the benefit of Owner, will determine, in general, if the Work is proceeding in accordance with the Contract Documents. Engineer will not be required to make exhaustive or

continuous inspections on the Site to check the quality or quantity of the Work. Engineer's efforts will be directed toward providing for Owner a greater degree of confidence that the completed Work will conform generally to the Contract Documents. On the basis of such visits and observations, Engineer will keep Owner informed of the progress of the Work and will endeavor to guard Owner against defective Work.

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

#### 9.03 *Project Representative*

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

#### 9.04 *Authorized Variations in Work*

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

#### 9.05 *Rejecting Defective Work*

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

9.06 *Shop Drawings, Change Orders and Payments*

- A. In connection with Engineer's authority, and limitations thereof, as to Shop Drawings and Samples, see Paragraph 6.17.
- B. In connection with Engineer's authority, and limitations thereof, as to design calculations and design drawings submitted in response to a delegation of professional design services, if any, see Paragraph 6.21.
- C. In connection with Engineer's authority as to Change Orders, see Articles 10, 11, and 12.
- D. In connection with Engineer's authority as to Applications for Payment, see Article 14.

9.07 *Determinations for Unit Price Work*

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

9.08 *Decisions on Requirements of Contract Documents and Acceptability of Work*

- A. Engineer will be the initial interpreter of the requirements of the Contract Documents and judge of the acceptability of the Work thereunder. All matters in question and other matters between Owner and Contractor arising prior to the date final payment is due relating to the acceptability of the Work, and the interpretation of the requirements of the Contract Documents pertaining to the performance of the Work, will be referred initially to Engineer in writing within 30 days of the event giving rise to the question.
- B. Engineer will, with reasonable promptness, render a written decision on the issue referred. If Owner or Contractor believes that any such decision entitles them to an adjustment in the Contract Price or Contract Times or both, a Claim may be made under Paragraph 10.05. The date of Engineer's decision shall be the date of the event giving rise to the issues referenced for the purposes of Paragraph 10.05.B.
- C. Engineer's written decision on the issue referred will be final and binding on Owner and Contractor, subject to the provisions of Paragraph 10.05.
- D. When functioning as interpreter and judge under this Paragraph 9.08, Engineer will not show partiality to Owner or Contractor and will not be liable in connection with any interpretation or decision rendered in good faith in such capacity.

9.09 *Limitations on Engineer's Authority and Responsibilities*

- A. Neither Engineer's authority or responsibility under this Article 9 or under any other provision of the Contract Documents nor any decision made by Engineer in good faith either to exercise

or not exercise such authority or responsibility or the undertaking, exercise, or performance of any authority or responsibility by Engineer shall create, impose, or give rise to any duty in contract, tort, or otherwise owed by Engineer to Contractor, any Subcontractor, any Supplier, any other individual or entity, or to any surety for or employee or agent of any of them.

- B. Engineer will not supervise, direct, control, or have authority over or be responsible for Contractor's means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or for any failure of Contractor to comply with Laws and Regulations applicable to the performance of the Work. Engineer will not be responsible for Contractor's failure to perform the Work in accordance with the Contract Documents.
- C. Engineer will not be responsible for the acts or omissions of Contractor or of any Subcontractor, any Supplier, or of any other individual or entity performing any of the Work.
- D. Engineer's review of the final Application for Payment and accompanying documentation and all maintenance and operating instructions, schedules, guarantees, bonds, certificates of inspection, tests and approvals, and other documentation required to be delivered by Paragraph 14.07.A will only be to determine generally that their content complies with the requirements of, and in the case of certificates of inspections, tests, and approvals that the results certified indicate compliance with, the Contract Documents.
- E. The limitations upon authority and responsibility set forth in this Paragraph 9.09 shall also apply to the Resident Project Representative, if any, and assistants, if any.

#### 9.10 *Compliance with Safety Program*

- A. While at the Site, Engineer's employees and representatives shall comply with the specific applicable requirements of Contractor's safety programs of which Engineer has been informed pursuant to Paragraph 6.13.D.

### **ARTICLE 10 – CHANGES IN THE WORK; CLAIMS**

#### 10.01 *Authorized Changes in the Work*

- A. Without invalidating the Contract and without notice to any surety, Owner may, at any time or from time to time, order additions, deletions, or revisions in the Work by a Change Order, or a Work Change Directive. Upon receipt of any such document, Contractor shall promptly proceed with the Work involved which will be performed under the applicable conditions of the Contract Documents (except as otherwise specifically provided).
- B. If Owner and Contractor are unable to agree on entitlement to, or on the amount or extent, if any, of an adjustment in the Contract Price or Contract Times, or both, that should be allowed as a result of a Work Change Directive, a Claim may be made therefor as provided in Paragraph 10.05.

## 10.02 *Unauthorized Changes in the Work*

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

## 10.03 *Execution of Change Orders*

- A. Owner and Contractor shall execute appropriate Change Orders recommended by Engineer covering:
  - 1. changes in the Work which are: (i) ordered by Owner pursuant to Paragraph 10.01.A, (ii) required because of acceptance of defective Work under Paragraph 13.08.A or Owner's correction of defective Work under Paragraph 13.09, or (iii) agreed to by the parties;
  - 2. changes in the Contract Price or Contract Times which are agreed to by the parties, including any undisputed sum or amount of time for Work actually performed in accordance with a Work Change Directive; and
  - 3. changes in the Contract Price or Contract Times which embody the substance of any written decision rendered by Engineer pursuant to Paragraph 10.05; provided that, in lieu of executing any such Change Order, an appeal may be taken from any such decision in accordance with the provisions of the Contract Documents and applicable Laws and Regulations, but during any such appeal, Contractor shall carry on the Work and adhere to the Progress Schedule as provided in Paragraph 6.18.A.

## 10.04 *Notification to Surety*

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

## 10.05 *Claims*

- A. *Engineer's Decision Required:* All Claims, except those waived pursuant to Paragraph 14.09, shall be referred to the Engineer for decision. A decision by Engineer shall be required as a condition precedent to any exercise by Owner or Contractor of any rights or remedies either may otherwise have under the Contract Documents or by Laws and Regulations in respect of such Claims.
- B. *Notice:* Written notice stating the general nature of each Claim shall be delivered by the claimant to Engineer and the other party to the Contract promptly (but in no event later than 30 days) after the start of the event giving rise thereto. The responsibility to substantiate a Claim shall rest with the party making the Claim. Notice of the amount or extent of the Claim, with supporting data

shall be delivered to the Engineer and the other party to the Contract within 60 days after the start of such event (unless Engineer allows additional time for claimant to submit additional or more accurate data in support of such Claim). A Claim for an adjustment in Contract Price shall be prepared in accordance with the provisions of Paragraph 12.01.B. A Claim for an adjustment in Contract Times shall be prepared in accordance with the provisions of Paragraph 12.02.B. Each Claim shall be accompanied by claimant's written statement that the adjustment claimed is the entire adjustment to which the claimant believes it is entitled as a result of said event. The opposing party shall submit any response to Engineer and the claimant within 30 days after receipt of the claimant's last submittal (unless Engineer allows additional time).

- C. *Engineer's Action:* Engineer will review each Claim and, within 30 days after receipt of the last submittal of the claimant or the last submittal of the opposing party, if any, take one of the following actions in writing:
1. deny the Claim in whole or in part;
  2. approve the Claim; or
  3. notify the parties that the Engineer is unable to resolve the Claim if, in the Engineer's sole discretion, it would be inappropriate for the Engineer to do so. For purposes of further resolution of the Claim, such notice shall be deemed a denial.
- D. In the event that Engineer does not take action on a Claim within said 30 days, the Claim shall be deemed denied.
- E. Engineer's written action under Paragraph 10.05.C or denial pursuant to Paragraphs 10.05.C.3 or 10.05.D will be final and binding upon Owner and Contractor, unless Owner or Contractor invoke the dispute resolution procedure set forth in Article 16 within 30 days of such action or denial.
- F. No Claim for an adjustment in Contract Price or Contract Times will be valid if not submitted in accordance with this Paragraph 10.05.

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## **ARTICLE 11 – COST OF THE WORK; ALLOWANCES; UNIT PRICE WORK**

### *11.01 Cost of the Work*

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

1. Payroll costs for employees in the direct employ of Contractor in the performance of the Work under schedules of job classifications agreed upon by Owner and Contractor. Such employees shall include, without limitation, superintendents, foremen, and other personnel employed full time on the Work. Payroll costs for employees not employed full time on the Work shall be apportioned on the basis of their time spent on the Work. Payroll costs shall include, but not be limited to, salaries and wages plus the cost of fringe benefits, which shall include social security contributions, unemployment, excise, and payroll taxes, workers' compensation, health and retirement benefits, bonuses, sick leave, vacation and holiday pay applicable thereto. The expenses of performing Work outside of regular working hours, on Saturday, Sunday, or legal holidays, shall be included in the above to the extent authorized by Owner.
2. Cost of all materials and equipment furnished and incorporated in the Work, including costs of transportation and storage thereof, and Suppliers' field services required in connection therewith. All cash discounts shall accrue to Contractor unless Owner deposits funds with Contractor with which to make payments, in which case the cash discounts shall accrue to Owner. All trade discounts, rebates and refunds and returns from sale of surplus materials and equipment shall accrue to Owner, and Contractor shall make provisions so that they may be obtained.
3. Payments made by Contractor to Subcontractors for Work performed by Subcontractors. If required by Owner, Contractor shall obtain competitive bids from subcontractors acceptable to Owner and Contractor and shall deliver such bids to Owner, who will then determine, with the advice of Engineer, which bids, if any, will be acceptable. If any subcontract provides that the Subcontractor is to be paid on the basis of Cost of the Work plus a fee, the Subcontractor's Cost of the Work and fee shall be determined in the same manner as Contractor's Cost of the Work and fee as provided in this Paragraph 11.01.
4. Costs of special consultants (including but not limited to engineers, architects, testing laboratories, surveyors, attorneys, and accountants) employed for services specifically related to the Work.
5. Supplemental costs including the following:
  - a. The proportion of necessary transportation, travel, and subsistence expenses of Contractor's employees incurred in discharge of duties connected with the Work.
  - b. Cost, including transportation and maintenance, of all materials, supplies, equipment, machinery, appliances, office, and temporary facilities at the Site, and hand tools not owned by the workers, which are consumed in the performance of the Work, and cost, less market value, of such items used but not consumed which remain the property of Contractor.
  - c. Rentals of all construction equipment and machinery, and the parts thereof whether rented from Contractor or others in accordance with rental agreements approved by Owner with the advice of Engineer, and the costs of transportation, loading, unloading, assembly, dismantling, and removal thereof. All such costs shall be in accordance with the terms of

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said rental agreements. The rental of any such equipment, machinery, or parts shall cease when the use thereof is no longer necessary for the Work.

- d. Sales, consumer, use, and other similar taxes related to the Work, and for which Contractor is liable, as imposed by Laws and Regulations.
- e. Deposits lost for causes other than negligence of Contractor, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable, and royalty payments and fees for permits and licenses.
- f. Losses and damages (and related expenses) caused by damage to the Work, not compensated by insurance or otherwise, sustained by Contractor in connection with the performance of the Work (except losses and damages within the deductible amounts of property insurance established in accordance with Paragraph 5.06.D), provided such losses and damages have resulted from causes other than the negligence of Contractor, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable. Such losses shall include settlements made with the written consent and approval of Owner. No such losses, damages, and expenses shall be included in the Cost of the Work for the purpose of determining Contractor's fee.
- g. The cost of utilities, fuel, and sanitary facilities at the Site.
- h. Minor expenses such as telegrams, long distance telephone calls, telephone service at the Site, express and courier services, and similar petty cash items in connection with the Work.
- i. The costs of premiums for all bonds and insurance Contractor is required by the Contract Documents to purchase and maintain.

B. *Costs Excluded:* The term Cost of the Work shall not include any of the following items:

1. Payroll costs and other compensation of Contractor's officers, executives, principals (of partnerships and sole proprietorships), general managers, safety managers, engineers, architects, estimators, attorneys, auditors, accountants, purchasing and contracting agents, expeditors, timekeepers, clerks, and other personnel employed by Contractor, whether at the Site or in Contractor's principal or branch office for general administration of the Work and not specifically included in the agreed upon schedule of job classifications referred to in Paragraph 11.01.A.1 or specifically covered by Paragraph 11.01.A.4, all of which are to be considered administrative costs covered by the Contractor's fee.
2. Expenses of Contractor's principal and branch offices other than Contractor's office at the Site.
3. Any part of Contractor's capital expenses, including interest on Contractor's capital employed for the Work and charges against Contractor for delinquent payments.
4. Costs due to the negligence of Contractor, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable, including but not

limited to, the correction of defective Work, disposal of materials or equipment wrongly supplied, and making good any damage to property.

5. Other overhead or general expense costs of any kind and the costs of any item not specifically and expressly included in Paragraphs 11.01.A.
- C. *Contractor's Fee:* When all the Work is performed on the basis of cost-plus, Contractor's fee shall be determined as set forth in the Agreement. When the value of any Work covered by a Change Order or when a Claim for an adjustment in Contract Price is determined on the basis of Cost of the Work, Contractor's fee shall be determined as set forth in Paragraph 12.01.C.
- D. *Documentation:* Whenever the Cost of the Work for any purpose is to be determined pursuant to Paragraphs 11.01.A and 11.01.B, Contractor will establish and maintain records thereof in accordance with generally accepted accounting practices and submit in a form acceptable to Engineer an itemized cost breakdown together with supporting data.

## 11.02 Allowances

A. It is understood that Contractor has included in the Contract Price all allowances so named in the Contract Documents and shall cause the Work so covered to be performed for such sums and by such persons or entities as may be acceptable to Owner and Engineer.

### B. *Cash Allowances:*

1. Contractor agrees that:

a. the cash allowances include the cost to Contractor (less any applicable trade discounts) of materials and equipment required by the allowances to be delivered at the Site, and all applicable taxes; and

b. Contractor's costs for unloading and handling on the Site, labor, installation, overhead, profit, and other expenses contemplated for the cash allowances have been included in the Contract Price and not in the allowances, and no demand for additional payment on account of any of the foregoing will be valid.

### C. *Contingency Allowance:*

1. Contractor agrees that a contingency allowance, if any, is for the sole use of Owner to cover unanticipated costs.

D. Prior to final payment, an appropriate Change Order will be issued as recommended by Engineer to reflect actual amounts due Contractor on account of Work covered by allowances, and the Contract Price shall be correspondingly adjusted.

## 11.03 Unit Price Work

A. Where the Contract Documents provide that all or part of the Work is to be Unit Price Work, initially the Contract Price will be deemed to include for all Unit Price Work an amount equal to

the sum of the unit price for each separately identified item of Unit Price Work times the estimated quantity of each item as indicated in the Agreement.

- B. The estimated quantities of items of Unit Price Work are not guaranteed and are solely for the purpose of comparison of Bids and determining an initial Contract Price. Determinations of the actual quantities and classifications of Unit Price Work performed by Contractor will be made by Engineer subject to the provisions of Paragraph 9.07.
- C. Each unit price will be deemed to include an amount considered by Contractor to be adequate to cover Contractor's overhead and profit for each separately identified item.
- D. Owner or Contractor may make a Claim for an adjustment in the Contract Price in accordance with Paragraph 10.05 if:
  - 1. the quantity of any item of Unit Price Work performed by Contractor differs materially and significantly from the estimated quantity of such item indicated in the Agreement; and
  - 2. there is no corresponding adjustment with respect to any other item of Work; and
  - 3. Contractor believes that Contractor is entitled to an increase in Contract Price as a result of having incurred additional expense or Owner believes that Owner is entitled to a decrease in Contract Price and the parties are unable to agree as to the amount of any such increase or decrease.

## **ARTICLE 12 – CHANGE OF CONTRACT PRICE; CHANGE OF CONTRACT TIMES**

### *12.01 Change of Contract Price*

- A. ~~The Contract Price may only be changed by a Change Order. Any Claim for an adjustment in the Contract Price shall be based on written notice submitted by the party making the Claim to the Engineer and the other party to the Contract in accordance with the provisions of Paragraph 10.05.~~
- B. The value of any Work covered by a Change Order or of any Claim for an adjustment in the Contract Price will be determined as follows:
  - 1. where the Work involved is covered by unit prices contained in the Contract Documents, by application of such unit prices to the quantities of the items involved (subject to the provisions of Paragraph 11.03); or
  - 2. where the Work involved is not covered by unit prices contained in the Contract Documents, by a mutually agreed lump sum (which may include an allowance for overhead and profit not necessarily in accordance with Paragraph 12.01.C.2); or
  - 3. where the Work involved is not covered by unit prices contained in the Contract Documents and agreement to a lump sum is not reached under Paragraph 12.01.B.2, on the basis of the Cost of the Work (determined as provided in Paragraph 11.01) plus a Contractor's fee for overhead and profit (determined as provided in Paragraph 12.01.C).

C. *Contractor's Fee*: The Contractor's fee for overhead and profit shall be determined as follows:

1. a mutually acceptable fixed fee; or
2. if a fixed fee is not agreed upon, then a fee based on the following percentages of the various portions of the Cost of the Work:
  - a. for costs incurred under Paragraphs 11.01.A.1 and 11.01.A.2, the Contractor's fee shall be 15 percent;
  - b. for costs incurred under Paragraph 11.01.A.3, the Contractor's fee shall be five percent;
  - c. where one or more tiers of subcontracts are on the basis of Cost of the Work plus a fee and no fixed fee is agreed upon, the intent of Paragraphs 12.01.C.2.a and 12.01.C.2.b is that the Subcontractor who actually performs the Work, at whatever tier, will be paid a fee of 15 percent of the costs incurred by such Subcontractor under Paragraphs 11.01.A.1 and 11.01.A.2 and that any higher tier Subcontractor and Contractor will each be paid a fee of five percent of the amount paid to the next lower tier Subcontractor;
  - d. no fee shall be payable on the basis of costs itemized under Paragraphs 11.01.A.4, 11.01.A.5, and 11.01.B;
  - e. the amount of credit to be allowed by Contractor to Owner for any change which results in a net decrease in cost will be the amount of the actual net decrease in cost plus a deduction in Contractor's fee by an amount equal to five percent of such net decrease; and
  - f. when both additions and credits are involved in any one change, the adjustment in Contractor's fee shall be computed on the basis of the net change in accordance with Paragraphs 12.01.C.2.a through 12.01.C.2.e, inclusive.

#### 12.02 *Change of Contract Times*

- A. The Contract Times may only be changed by a Change Order. Any Claim for an adjustment in the Contract Times shall be based on written notice submitted by the party making the Claim to the Engineer and the other party to the Contract in accordance with the provisions of Paragraph 10.05.
- B. Any adjustment of the Contract Times covered by a Change Order or any Claim for an adjustment in the Contract Times will be determined in accordance with the provisions of this Article 12.

#### 12.03 *Delays*

- A. Where Contractor is prevented from completing any part of the Work within the Contract Times due to delay beyond the control of Contractor, the Contract Times will be extended in an amount equal to the time lost due to such delay if a Claim is made therefor as provided in Paragraph 12.02.A. Delays beyond the control of Contractor shall include, but not be limited to, acts or

neglect by Owner, acts or neglect of utility owners or other contractors performing other work as contemplated by Article 7, fires, floods, epidemics, abnormal weather conditions, or acts of God.

- B. If Owner, Engineer, or other contractors or utility owners performing other work for Owner as contemplated by Article 7, or anyone for whom Owner is responsible, delays, disrupts, or interferes with the performance or progress of the Work, then Contractor shall be entitled to an equitable adjustment in the Contract Price or the Contract Times, or both. Contractor's entitlement to an adjustment of the Contract Times is conditioned on such adjustment being essential to Contractor's ability to complete the Work within the Contract Times.
- C. If Contractor is delayed in the performance or progress of the Work by fire, flood, epidemic, abnormal weather conditions, acts of God, acts or failures to act of utility owners not under the control of Owner, or other causes not the fault of and beyond control of Owner and Contractor, then Contractor shall be entitled to an equitable adjustment in Contract Times, if such adjustment is essential to Contractor's ability to complete the Work within the Contract Times. Such an adjustment shall be Contractor's sole and exclusive remedy for the delays described in this Paragraph 12.03.C.
- D. Owner, Engineer, and their officers, directors, members, partners, employees, agents, consultants, or subcontractors shall not be liable to Contractor for any claims, costs, losses, or damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) sustained by Contractor on or in connection with any other project or anticipated project.
- E. Contractor shall not be entitled to an adjustment in Contract Price or Contract Times for delays within the control of Contractor. Delays attributable to and within the control of a Subcontractor or Supplier shall be deemed to be delays within the control of Contractor.

## **ARTICLE 13 – TESTS AND INSPECTIONS; CORRECTION, REMOVAL OR ACCEPTANCE OF DEFECTIVE WORK**

**REFERENCE ONLY**

### 13.01 *Notice of Defects*

- A. Prompt notice of all defective Work of which Owner or Engineer has actual knowledge will be given to Contractor. Defective Work may be rejected, corrected, or accepted as provided in this Article 13.

### 13.02 *Access to Work*

- A. Owner, Engineer, their consultants and other representatives and personnel of Owner, independent testing laboratories, and governmental agencies with jurisdictional interests will have access to the Site and the Work at reasonable times for their observation, inspection, and testing. Contractor shall provide them proper and safe conditions for such access and advise them of Contractor's safety procedures and programs so that they may comply therewith as applicable.

### 13.03 *Tests and Inspections*

- A. Contractor shall give Engineer timely notice of readiness of the Work for all required inspections, tests, or approvals and shall cooperate with inspection and testing personnel to facilitate required inspections or tests.
- B. Owner shall employ and pay for the services of an independent testing laboratory to perform all inspections, tests, or approvals required by the Contract Documents except:
  - 1. for inspections, tests, or approvals covered by Paragraphs 13.03.C and 13.03.D below;
  - 2. that costs incurred in connection with tests or inspections conducted pursuant to Paragraph 13.04.B shall be paid as provided in Paragraph 13.04.C; and
  - 3. as otherwise specifically provided in the Contract Documents.
- C. If Laws or Regulations of any public body having jurisdiction require any Work (or part thereof) specifically to be inspected, tested, or approved by an employee or other representative of such public body, Contractor shall assume full responsibility for arranging and obtaining such inspections, tests, or approvals, pay all costs in connection therewith, and furnish Engineer the required certificates of inspection or approval.
- D. Contractor shall be responsible for arranging and obtaining and shall pay all costs in connection with any inspections, tests, or approvals required for Owner's and Engineer's acceptance of materials or equipment to be incorporated in the Work; or acceptance of materials, mix designs, or equipment submitted for approval prior to Contractor's purchase thereof for incorporation in the Work. Such inspections, tests, or approvals shall be performed by organizations acceptable to Owner and Engineer.
- E. If any Work (or the work of others) that is to be inspected, tested, or approved is covered by Contractor without written concurrence of Engineer, Contractor shall, if requested by Engineer, uncover such Work for observation.
- F. Uncovering Work as provided in Paragraph 13.03.E shall be at Contractor's expense unless Contractor has given Engineer timely notice of Contractor's intention to cover the same and Engineer has not acted with reasonable promptness in response to such notice.

### 13.04 *Uncovering Work*

- A. If any Work is covered contrary to the written request of Engineer, it must, if requested by Engineer, be uncovered for Engineer's observation and replaced at Contractor's expense.
- B. If Engineer considers it necessary or advisable that covered Work be observed by Engineer or inspected or tested by others, Contractor, at Engineer's request, shall uncover, expose, or otherwise make available for observation, inspection, or testing as Engineer may require, that portion of the Work in question, furnishing all necessary labor, material, and equipment.

- C. If it is found that the uncovered Work is defective, Contractor shall pay all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such uncovering, exposure, observation, inspection, and testing, and of satisfactory replacement or reconstruction (including but not limited to all costs of repair or replacement of work of others); and Owner shall be entitled to an appropriate decrease in the Contract Price. If the parties are unable to agree as to the amount thereof, Owner may make a Claim therefor as provided in Paragraph 10.05.
- D. If the uncovered Work is not found to be defective, Contractor shall be allowed an increase in the Contract Price or an extension of the Contract Times, or both, directly attributable to such uncovering, exposure, observation, inspection, testing, replacement, and reconstruction. If the parties are unable to agree as to the amount or extent thereof, Contractor may make a Claim therefor as provided in Paragraph 10.05.

13.05 *Owner May Stop the Work*

- A. If the Work is defective, or Contractor fails to supply sufficient skilled workers or suitable materials or equipment, or fails to perform the Work in such a way that the completed Work will conform to the Contract Documents, Owner may order Contractor to stop the Work, or any portion thereof, until the cause for such order has been eliminated; however, this right of Owner to stop the Work shall not give rise to any duty on the part of Owner to exercise this right for the benefit of Contractor, any Subcontractor, any Supplier, any other individual or entity, or any surety for, or employee or agent of any of them.

13.06 *Correction or Removal of Defective Work*

- A. Promptly after receipt of written notice, Contractor shall correct all defective Work, whether or not fabricated, installed, or completed, or, if the Work has been rejected by Engineer, remove it from the Project and replace it with Work that is not defective. Contractor shall pay all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such correction or removal (including but not limited to all costs of repair or replacement of work of others).
- B. When correcting defective Work under the terms of this Paragraph 13.06 or Paragraph 13.07, Contractor shall take no action that would void or otherwise impair Owner's special warranty and guarantee, if any, on said Work.

13.07 *Correction Period*

- A. If within one year after the date of Substantial Completion (or such longer period of time as may be prescribed by the terms of any applicable special guarantee required by the Contract Documents) or by any specific provision of the Contract Documents, any Work is found to be defective, or if the repair of any damages to the land or areas made available for Contractor's use by Owner or permitted by Laws and Regulations as contemplated in Paragraph 6.11.A is found to be defective, Contractor shall promptly, without cost to Owner and in accordance with Owner's written instructions:

1. repair such defective land or areas; or
  2. correct such defective Work; or
  3. if the defective Work has been rejected by Owner, remove it from the Project and replace it with Work that is not defective, and
  4. satisfactorily correct or repair or remove and replace any damage to other Work, to the work of others or other land or areas resulting therefrom.
- B. If Contractor does not promptly comply with the terms of Owner's written instructions, or in an emergency where delay would cause serious risk of loss or damage, Owner may have the defective Work corrected or repaired or may have the rejected Work removed and replaced. All claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such correction or repair or such removal and replacement (including but not limited to all costs of repair or replacement of work of others) will be paid by Contractor.
- C. In special circumstances where a particular item of equipment is placed in continuous service before Substantial Completion of all the Work, the correction period for that item may start to run from an earlier date if so provided in the Specifications.
- D. Where defective Work (and damage to other Work resulting therefrom) has been corrected or removed and replaced under this Paragraph 13.07, the correction period hereunder with respect to such Work will be extended for an additional period of one year after such correction or removal and replacement has been satisfactorily completed.
- E. Contractor's obligations under this Paragraph 13.07 are in addition to any other obligation or warranty. The provisions of this Paragraph 13.07 shall not be construed as a substitute for, or a waiver of, the provisions of any applicable statute of limitation or repose.

### 13.08 *Acceptance of Defective Work*

- A. If, instead of requiring correction or removal and replacement of defective Work, Owner (and, prior to Engineer's recommendation of final payment, Engineer) prefers to accept it, Owner may do so. Contractor shall pay all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) attributable to Owner's evaluation of and determination to accept such defective Work (such costs to be approved by Engineer as to reasonableness) and for the diminished value of the Work to the extent not otherwise paid by Contractor pursuant to this sentence. If any such acceptance occurs prior to Engineer's recommendation of final payment, a Change Order will be issued incorporating the necessary revisions in the Contract Documents with respect to the Work, and Owner shall be entitled to an appropriate decrease in the Contract Price, reflecting the diminished value of Work so accepted. If the parties are unable to agree as to the amount thereof, Owner may make a Claim therefor as provided in Paragraph 10.05. If the acceptance occurs after such recommendation, an appropriate amount will be paid by Contractor to Owner.

### 13.09 *Owner May Correct Defective Work*

- A. If Contractor fails within a reasonable time after written notice from Engineer to correct defective Work, or to remove and replace rejected Work as required by Engineer in accordance with Paragraph 13.06.A, or if Contractor fails to perform the Work in accordance with the Contract Documents, or if Contractor fails to comply with any other provision of the Contract Documents, Owner may, after seven days written notice to Contractor, correct, or remedy any such deficiency.
- B. In exercising the rights and remedies under this Paragraph 13.09, Owner shall proceed expeditiously. In connection with such corrective or remedial action, Owner may exclude Contractor from all or part of the Site, take possession of all or part of the Work and suspend Contractor's services related thereto, take possession of Contractor's tools, appliances, construction equipment and machinery at the Site, and incorporate in the Work all materials and equipment stored at the Site or for which Owner has paid Contractor but which are stored elsewhere. Contractor shall allow Owner, Owner's representatives, agents and employees, Owner's other contractors, and Engineer and Engineer's consultants access to the Site to enable Owner to exercise the rights and remedies under this Paragraph.
- C. All claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) incurred or sustained by Owner in exercising the rights and remedies under this Paragraph 13.09 will be charged against Contractor, and a Change Order will be issued incorporating the necessary revisions in the Contract Documents with respect to the Work; and Owner shall be entitled to an appropriate decrease in the Contract Price. If the parties are unable to agree as to the amount of the adjustment, Owner may make a Claim therefor as provided in Paragraph 10.05. Such claims, costs, losses and damages will include but not be limited to all costs of repair, or replacement of work of others destroyed or damaged by correction, removal, or replacement of Contractor's defective Work.
- D. Contractor shall not be allowed an extension of the Contract Times because of any delay in the performance of the Work attributable to the exercise by Owner of Owner's rights and remedies under this Paragraph 13.09.

## **ARTICLE 14 – PAYMENTS TO CONTRACTOR AND COMPLETION**

### 14.01 *Schedule of Values*

- A. The Schedule of Values established as provided in Paragraph 2.07.A will serve as the basis for progress payments and will be incorporated into a form of Application for Payment acceptable to Engineer. Progress payments on account of Unit Price Work will be based on the number of units completed.

### 14.02 *Progress Payments*

#### A. *Applications for Payments:*

1. At least 20 days before the date established in the Agreement for each progress payment (but not more often than once a month), Contractor shall submit to Engineer for review an

Application for Payment filled out and signed by Contractor covering the Work completed as of the date of the Application and accompanied by such supporting documentation as is required by the Contract Documents. If payment is requested on the basis of materials and equipment not incorporated in the Work but delivered and suitably stored at the Site or at another location agreed to in writing, the Application for Payment shall also be accompanied by a bill of sale, invoice, or other documentation warranting that Owner has received the materials and equipment free and clear of all Liens and evidence that the materials and equipment are covered by appropriate property insurance or other arrangements to protect Owner's interest therein, all of which must be satisfactory to Owner.

2. Beginning with the second Application for Payment, each Application shall include an affidavit of Contractor stating that all previous progress payments received on account of the Work have been applied on account to discharge Contractor's legitimate obligations associated with prior Applications for Payment.
3. The amount of retainage with respect to progress payments will be as stipulated in the Agreement.

*B. Review of Applications:*

1. Engineer will, within 10 days after receipt of each Application for Payment, either indicate in writing a recommendation of payment and present the Application to Owner or return the Application to Contractor indicating in writing Engineer's reasons for refusing to recommend payment. In the latter case, Contractor may make the necessary corrections and resubmit the Application.
2. Engineer's recommendation of any payment requested in an Application for Payment will constitute a representation by Engineer to Owner, based on Engineer's observations of the executed Work as an experienced and qualified design professional, and on Engineer's review of the Application for Payment and the accompanying data and schedules, that to the best of Engineer's knowledge, information and belief:
  - a. the Work has progressed to the point indicated;
  - b. the quality of the Work is generally in accordance with the Contract Documents (subject to an evaluation of the Work as a functioning whole prior to or upon Substantial Completion, the results of any subsequent tests called for in the Contract Documents, a final determination of quantities and classifications for Unit Price Work under Paragraph 9.07, and any other qualifications stated in the recommendation); and
  - c. the conditions precedent to Contractor's being entitled to such payment appear to have been fulfilled in so far as it is Engineer's responsibility to observe the Work.
3. By recommending any such payment Engineer will not thereby be deemed to have represented that:
  - a. inspections made to check the quality or the quantity of the Work as it has been performed have been exhaustive, extended to every aspect of the Work in progress, or

involved detailed inspections of the Work beyond the responsibilities specifically assigned to Engineer in the Contract Documents; or

- b. there may not be other matters or issues between the parties that might entitle Contractor to be paid additionally by Owner or entitle Owner to withhold payment to Contractor.
4. Neither Engineer's review of Contractor's Work for the purposes of recommending payments nor Engineer's recommendation of any payment, including final payment, will impose responsibility on Engineer:
    - a. to supervise, direct, or control the Work, or
    - b. for the means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or
    - c. for Contractor's failure to comply with Laws and Regulations applicable to Contractor's performance of the Work, or
    - d. to make any examination to ascertain how or for what purposes Contractor has used the moneys paid on account of the Contract Price, or
    - e. to determine that title to any of the Work, materials, or equipment has passed to Owner free and clear of any Liens.
  5. Engineer may refuse to recommend the whole or any part of any payment if, in Engineer's opinion, it would be incorrect to make the representations to Owner stated in Paragraph 14.02.B.2. Engineer may also refuse to recommend any such payment or, because of subsequently discovered evidence or the results of subsequent inspections or tests, revise or revoke any such payment recommendation previously made, to such extent as may be necessary in Engineer's opinion to protect Owner from loss because:
    - a. the Work is defective, or completed Work has been damaged, requiring correction or replacement;
    - b. the Contract Price has been reduced by Change Orders;
    - c. Owner has been required to correct defective Work or complete Work in accordance with Paragraph 13.09; or
    - d. Engineer has actual knowledge of the occurrence of any of the events enumerated in Paragraph 15.02.A.

*C. Payment Becomes Due:*

1. Ten days after presentation of the Application for Payment to Owner with Engineer's recommendation, the amount recommended will (subject to the provisions of Paragraph 14.02.D) become due, and when due will be paid by Owner to Contractor.

D. *Reduction in Payment:*

1. Owner may refuse to make payment of the full amount recommended by Engineer because:
  - a. claims have been made against Owner on account of Contractor's performance or furnishing of the Work;
  - b. Liens have been filed in connection with the Work, except where Contractor has delivered a specific bond satisfactory to Owner to secure the satisfaction and discharge of such Liens;
  - c. there are other items entitling Owner to a set-off against the amount recommended; or
  - d. Owner has actual knowledge of the occurrence of any of the events enumerated in Paragraphs 14.02.B.5.a through 14.02.B.5.c or Paragraph 15.02.A.
2. If Owner refuses to make payment of the full amount recommended by Engineer, Owner will give Contractor immediate written notice (with a copy to Engineer) stating the reasons for such action and promptly pay Contractor any amount remaining after deduction of the amount so withheld. Owner shall promptly pay Contractor the amount so withheld, or any adjustment thereto agreed to by Owner and Contractor, when Contractor remedies the reasons for such action.
3. Upon a subsequent determination that Owner's refusal of payment was not justified, the amount wrongfully withheld shall be treated as an amount due as determined by Paragraph 14.02.C.1 and subject to interest as provided in the Agreement.

14.03 *Contractor's Warranty of Title*

- REFERENCE ONLY**
- A. Contractor warrants and guarantees that title to all Work, materials, and equipment covered by any Application for Payment, whether incorporated in the Project or not, will pass to Owner no later than the time of payment free and clear of all Liens.

14.04 *Substantial Completion*

- A. When Contractor considers the entire Work ready for its intended use Contractor shall notify Owner and Engineer in writing that the entire Work is substantially complete (except for items specifically listed by Contractor as incomplete) and request that Engineer issue a certificate of Substantial Completion.
- B. Promptly after Contractor's notification, Owner, Contractor, and Engineer shall make an inspection of the Work to determine the status of completion. If Engineer does not consider the Work substantially complete, Engineer will notify Contractor in writing giving the reasons therefor.
- C. If Engineer considers the Work substantially complete, Engineer will deliver to Owner a tentative certificate of Substantial Completion which shall fix the date of Substantial Completion. There shall be attached to the certificate a tentative list of items to be completed or corrected before

final payment. Owner shall have seven days after receipt of the tentative certificate during which to make written objection to Engineer as to any provisions of the certificate or attached list. If, after considering such objections, Engineer concludes that the Work is not substantially complete, Engineer will, within 14 days after submission of the tentative certificate to Owner, notify Contractor in writing, stating the reasons therefor. If, after consideration of Owner's objections, Engineer considers the Work substantially complete, Engineer will, within said 14 days, execute and deliver to Owner and Contractor a definitive certificate of Substantial Completion (with a revised tentative list of items to be completed or corrected) reflecting such changes from the tentative certificate as Engineer believes justified after consideration of any objections from Owner.

- D. At the time of delivery of the tentative certificate of Substantial Completion, Engineer will deliver to Owner and Contractor a written recommendation as to division of responsibilities pending final payment between Owner and Contractor with respect to security, operation, safety, and protection of the Work, maintenance, heat, utilities, insurance, and warranties and guarantees. Unless Owner and Contractor agree otherwise in writing and so inform Engineer in writing prior to Engineer's issuing the definitive certificate of Substantial Completion, Engineer's aforesaid recommendation will be binding on Owner and Contractor until final payment.
- E. Owner shall have the right to exclude Contractor from the Site after the date of Substantial Completion subject to allowing Contractor reasonable access to remove its property and complete or correct items on the tentative list.

#### 14.05 *Partial Utilization*

- A. Prior to Substantial Completion of all the Work, Owner may use or occupy any substantially completed part of the Work which has specifically been identified in the Contract Documents, or which Owner, Engineer, and Contractor agree constitutes a separately functioning and usable part of the Work that can be used by Owner for its intended purpose without significant interference with Contractor's performance of the remainder of the Work, subject to the following conditions:
  1. Owner at any time may request Contractor in writing to permit Owner to use or occupy any such part of the Work which Owner believes to be ready for its intended use and substantially complete. If and when Contractor agrees that such part of the Work is substantially complete, Contractor, Owner, and Engineer will follow the procedures of Paragraph 14.04.A through D for that part of the Work.
  2. Contractor at any time may notify Owner and Engineer in writing that Contractor considers any such part of the Work ready for its intended use and substantially complete and request Engineer to issue a certificate of Substantial Completion for that part of the Work.
  3. Within a reasonable time after either such request, Owner, Contractor, and Engineer shall make an inspection of that part of the Work to determine its status of completion. If Engineer does not consider that part of the Work to be substantially complete, Engineer will notify Owner and Contractor in writing giving the reasons therefor. If Engineer considers that part of the Work to be substantially complete, the provisions of Paragraph 14.04 will apply with respect to certification of Substantial Completion of that part of the Work and the division of responsibility in respect thereof and access thereto.

4. No use or occupancy or separate operation of part of the Work may occur prior to compliance with the requirements of Paragraph 5.10 regarding property insurance.

#### 14.06 *Final Inspection*

- A. Upon written notice from Contractor that the entire Work or an agreed portion thereof is complete, Engineer will promptly make a final inspection with Owner and Contractor and will notify Contractor in writing of all particulars in which this inspection reveals that the Work is incomplete or defective. Contractor shall immediately take such measures as are necessary to complete such Work or remedy such deficiencies.

#### 14.07 *Final Payment*

##### A. *Application for Payment:*

1. After Contractor has, in the opinion of Engineer, satisfactorily completed all corrections identified during the final inspection and has delivered, in accordance with the Contract Documents, all maintenance and operating instructions, schedules, guarantees, bonds, certificates or other evidence of insurance, certificates of inspection, marked-up record documents (as provided in Paragraph 6.12), and other documents, Contractor may make application for final payment following the procedure for progress payments.
2. The final Application for Payment shall be accompanied (except as previously delivered) by:
  - a. all documentation called for in the Contract Documents, including but not limited to the evidence of insurance required by Paragraph 5.04.B.6;
  - b. consent of the surety, if any, to final payment;
  - c. a list of all Claims against Owner that Contractor believes are unsettled; and
  - d. complete and legally effective releases or waivers (satisfactory to Owner) of all Lien rights arising out of or Liens filed in connection with the Work.
3. In lieu of the releases or waivers of Liens specified in Paragraph 14.07.A.2 and as approved by Owner, Contractor may furnish receipts or releases in full and an affidavit of Contractor that: (i) the releases and receipts include all labor, services, material, and equipment for which a Lien could be filed; and (ii) all payrolls, material and equipment bills, and other indebtedness connected with the Work for which Owner might in any way be responsible, or which might in any way result in liens or other burdens on Owner's property, have been paid or otherwise satisfied. If any Subcontractor or Supplier fails to furnish such a release or receipt in full, Contractor may furnish a bond or other collateral satisfactory to Owner to indemnify Owner against any Lien.

##### B. *Engineer's Review of Application and Acceptance:*

1. If, on the basis of Engineer's observation of the Work during construction and final inspection, and Engineer's review of the final Application for Payment and accompanying

documentation as required by the Contract Documents, Engineer is satisfied that the Work has been completed and Contractor's other obligations under the Contract Documents have been fulfilled, Engineer will, within ten days after receipt of the final Application for Payment, indicate in writing Engineer's recommendation of payment and present the Application for Payment to Owner for payment. At the same time Engineer will also give written notice to Owner and Contractor that the Work is acceptable subject to the provisions of Paragraph 14.09. Otherwise, Engineer will return the Application for Payment to Contractor, indicating in writing the reasons for refusing to recommend final payment, in which case Contractor shall make the necessary corrections and resubmit the Application for Payment.

C. *Payment Becomes Due:*

1. Thirty days after the presentation to Owner of the Application for Payment and accompanying documentation, the amount recommended by Engineer, less any sum Owner is entitled to set off against Engineer's recommendation, including but not limited to liquidated damages, will become due and will be paid by Owner to Contractor.

14.08 *Final Completion Delayed*

- A. If, through no fault of Contractor, final completion of the Work is significantly delayed, and if Engineer so confirms, Owner shall, upon receipt of Contractor's final Application for Payment (for Work fully completed and accepted) and recommendation of Engineer, and without terminating the Contract, make payment of the balance due for that portion of the Work fully completed and accepted. If the remaining balance to be held by Owner for Work not fully completed or corrected is less than the retainage stipulated in the Agreement, and if bonds have been furnished as required in Paragraph 5.01, the written consent of the surety to the payment of the balance due for that portion of the Work fully completed and accepted shall be submitted by Contractor to Engineer with the Application for such payment. Such payment shall be made under the terms and conditions governing final payment, except that it shall not constitute a waiver of Claims.

14.09 *Waiver of Claims*

- A. The making and acceptance of final payment will constitute:
1. a waiver of all Claims by Owner against Contractor, except Claims arising from unsettled Liens, from defective Work appearing after final inspection pursuant to Paragraph 14.06, from failure to comply with the Contract Documents or the terms of any special guarantees specified therein, or from Contractor's continuing obligations under the Contract Documents; and
  2. a waiver of all Claims by Contractor against Owner other than those previously made in accordance with the requirements herein and expressly acknowledged by Owner in writing as still unsettled.

## ARTICLE 15 – SUSPENSION OF WORK AND TERMINATION

### 15.01 *Owner May Suspend Work*

- A. At any time and without cause, Owner may suspend the Work or any portion thereof for a period of not more than 90 consecutive days by notice in writing to Contractor and Engineer which will fix the date on which Work will be resumed. Contractor shall resume the Work on the date so fixed. Contractor shall be granted an adjustment in the Contract Price or an extension of the Contract Times, or both, directly attributable to any such suspension if Contractor makes a Claim therefor as provided in Paragraph 10.05.

### 15.02 *Owner May Terminate for Cause*

- A. The occurrence of any one or more of the following events will justify termination for cause:
1. Contractor's persistent failure to perform the Work in accordance with the Contract Documents (including, but not limited to, failure to supply sufficient skilled workers or suitable materials or equipment or failure to adhere to the Progress Schedule established under Paragraph 2.07 as adjusted from time to time pursuant to Paragraph 6.04);
  2. Contractor's disregard of Laws or Regulations of any public body having jurisdiction;
  3. Contractor's repeated disregard of the authority of Engineer; or
  4. Contractor's violation in any substantial way of any provisions of the Contract Documents.
- B. If one or more of the events identified in Paragraph 15.02.A occur, Owner may, after giving Contractor (and surety) seven days written notice of its intent to terminate the services of Contractor:
1. exclude Contractor from the Site, and take possession of the Work and of all Contractor's tools, appliances, construction equipment, and machinery at the Site, and use the same to the full extent they could be used by Contractor (without liability to Contractor for trespass or conversion);
  2. incorporate in the Work all materials and equipment stored at the Site or for which Owner has paid Contractor but which are stored elsewhere; and
  3. complete the Work as Owner may deem expedient.
- C. If Owner proceeds as provided in Paragraph 15.02.B, Contractor shall not be entitled to receive any further payment until the Work is completed. If the unpaid balance of the Contract Price exceeds all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) sustained by Owner arising out of or relating to completing the Work, such excess will be paid to Contractor. If such claims, costs, losses, and damages exceed such unpaid balance, Contractor shall pay the difference to Owner. Such claims, costs, losses, and damages incurred by Owner will be reviewed by Engineer as to their reasonableness and, when

so approved by Engineer, incorporated in a Change Order. When exercising any rights or remedies under this Paragraph, Owner shall not be required to obtain the lowest price for the Work performed.

- D. Notwithstanding Paragraphs 15.02.B and 15.02.C, Contractor's services will not be terminated if Contractor begins within seven days of receipt of notice of intent to terminate to correct its failure to perform and proceeds diligently to cure such failure within no more than 30 days of receipt of said notice.
- E. Where Contractor's services have been so terminated by Owner, the termination will not affect any rights or remedies of Owner against Contractor then existing or which may thereafter accrue. Any retention or payment of moneys due Contractor by Owner will not release Contractor from liability.
- F. If and to the extent that Contractor has provided a performance bond under the provisions of Paragraph 5.01.A, the termination procedures of that bond shall supersede the provisions of Paragraphs 15.02.B and 15.02.C.

#### 15.03 *Owner May Terminate For Convenience*

- A. Upon seven days written notice to Contractor and Engineer, Owner may, without cause and without prejudice to any other right or remedy of Owner, terminate the Contract. In such case, Contractor shall be paid for (without duplication of any items):
  - 1. completed and acceptable Work executed in accordance with the Contract Documents prior to the effective date of termination, including fair and reasonable sums for overhead and profit on such Work;
  - 2. expenses sustained prior to the effective date of termination in performing services and furnishing labor, materials, or equipment as required by the Contract Documents in connection with uncompleted Work, plus fair and reasonable sums for overhead and profit on such expenses;
  - 3. all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) incurred in settlement of terminated contracts with Subcontractors, Suppliers, and others; and
  - 4. reasonable expenses directly attributable to termination.
- B. Contractor shall not be paid on account of loss of anticipated profits or revenue or other economic loss arising out of or resulting from such termination.

#### 15.04 *Contractor May Stop Work or Terminate*

- A. If, through no act or fault of Contractor, (i) the Work is suspended for more than 90 consecutive days by Owner or under an order of court or other public authority, or (ii) Engineer fails to act on any Application for Payment within 30 days after it is submitted, or (iii) Owner fails for 30 days

to pay Contractor any sum finally determined to be due, then Contractor may, upon seven days written notice to Owner and Engineer, and provided Owner or Engineer do not remedy such suspension or failure within that time, terminate the Contract and recover from Owner payment on the same terms as provided in Paragraph 15.03.

- B. In lieu of terminating the Contract and without prejudice to any other right or remedy, if Engineer has failed to act on an Application for Payment within 30 days after it is submitted, or Owner has failed for 30 days to pay Contractor any sum finally determined to be due, Contractor may, seven days after written notice to Owner and Engineer, stop the Work until payment is made of all such amounts due Contractor, including interest thereon. The provisions of this Paragraph 15.04 are not intended to preclude Contractor from making a Claim under Paragraph 10.05 for an adjustment in Contract Price or Contract Times or otherwise for expenses or damage directly attributable to Contractor's stopping the Work as permitted by this Paragraph.

## **ARTICLE 16 – DISPUTE RESOLUTION**

### *16.01 Methods and Procedures*

- A. Either Owner or Contractor may request mediation of any Claim submitted to Engineer for a decision under Paragraph 10.05 before such decision becomes final and binding. The mediation will be governed by the Construction Industry Mediation Rules of the American Arbitration Association in effect as of the Effective Date of the Agreement. The request for mediation shall be submitted in writing to the American Arbitration Association and the other party to the Contract. Timely submission of the request shall stay the effect of Paragraph 10.05.E.
- B. Owner and Contractor shall participate in the mediation process in good faith. The process shall be concluded within 60 days of filing of the request. The date of termination of the mediation shall be determined by application of the mediation rules referenced above.
- C. If the Claim is not resolved by mediation, Engineer's action under Paragraph 10.05.C or a denial pursuant to Paragraphs 10.05.C.3 or 10.05.D shall become final and binding 30 days after termination of the mediation unless, within that time period, Owner or Contractor:
1. elects in writing to invoke any dispute resolution process provided for in the Supplementary Conditions; or
  2. agrees with the other party to submit the Claim to another dispute resolution process; or
  3. gives written notice to the other party of the intent to submit the Claim to a court of competent jurisdiction.

## **ARTICLE 17 – MISCELLANEOUS**

### *17.01 Giving Notice*

- A. Whenever any provision of the Contract Documents requires the giving of written notice, it will be deemed to have been validly given if:

1. delivered in person to the individual or to a member of the firm or to an officer of the corporation for whom it is intended; or
2. delivered at or sent by registered or certified mail, postage prepaid, to the last business address known to the giver of the notice.

17.02 *Computation of Times*

- A. When any period of time is referred to in the Contract Documents by days, it will be computed to exclude the first and include the last day of such period. If the last day of any such period falls on a Saturday or Sunday or on a day made a legal holiday by the law of the applicable jurisdiction, such day will be omitted from the computation.

17.03 *Cumulative Remedies*

- A. The duties and obligations imposed by these General Conditions and the rights and remedies available hereunder to the parties hereto are in addition to, and are not to be construed in any way as a limitation of, any rights and remedies available to any or all of them which are otherwise imposed or available by Laws or Regulations, by special warranty or guarantee, or by other provisions of the Contract Documents. The provisions of this Paragraph will be as effective as if repeated specifically in the Contract Documents in connection with each particular duty, obligation, right, and remedy to which they apply.

17.04 *Survival of Obligations*

- A. All representations, indemnifications, warranties, and guarantees made in, required by, or given in accordance with the Contract Documents, as well as all continuing obligations indicated in the Contract Documents, will survive final payment, completion, and acceptance of the Work or termination or completion of the Contract or termination of the services of Contractor.

17.05 *Controlling Law*

- A. This Contract is to be governed by the law of the state in which the Project is located.

17.06 *Headings*

- A. Article and paragraph headings are inserted for convenience only and do not constitute parts of these General Conditions.

REFERENCE ONLY

**DOCUMENT 00710****SPECIAL CONDITIONS**

- SC-1 DESCRIPTION OF THE WORK:** Improvements to approximately 18-acre parcel within the Florence County Industrial Park East, Florence County, South Carolina. The development will include an approximately 100,200 SF mass graded pad and site improvements, ±635 linear feet of asphalt paved roadway, and asphalt paved dedicated right-turn lane, including gravel turnaround, with center concrete curb and gutter island, clearing and grubbing; grading; erosion control; ditched storm drainage system with RCP culverts with wet stormwater detention pond; ±80 of 12" DIP water line extension, ±810 linear of 12" PVC - C900 - DR 18 water line extension, jack & bore ±45 linear feet of 20" steel casing; ±3,734 linear feet of 12" PVC – SDR 26 sewer service line; and incidental construction in accordance with the plans and specifications.
- SC-2 COMMENCEMENT AND COMPLETION OF WORK:** See Standard Agreement 00506.
- SC-3 DRAWINGS:** The work shall conform to the following drawings, all of which form a part of, and are included in, these specifications and are available in the office of Thomas & Hutton Engineering Co., 1501 Main Street.; Suite 760, Columbia, SC 29201.

Sheet Number	Sheet Title
CS	COVER SHEET
G0.1	GENERAL NOTES & INDEX
EX1.1 – EX1.3	EXISTING CONDITIONS PLAN
C1.1	SITE PLAN
EC0.1	EROSION CONTROL NOTES
EC0.2	EROSION CONTROL CHARTS
EC 1.1 - EC3.2	EROSION CONTROL PLAN
EC4.1 – EC4.3	EROSION CONTROL DETAILS
C2.1	WATER PLAN
C2.2-C2.5	SEWER PLAN & PROFILE
C2.6 – C2.7	UTILITY DETAILS
C3.0	PAVING, GRADING, & DRAINAGE PLAN
C3.1	ROAD PLAN AND PROFILE
C3.2	OFF-SITE ROADWAY PLAN
C3.3	TYPICAL ROADWAY SECTIONS
C3.4	DRAINAGE PROFILES
C5.0	STRIPING AND SIGNAGE PLAN
C5.1 – C5.2	SITE DETAILS
C6.1	CROSS SECTIONS
C7.1 – C7.2	TRAFFIC CONTROL DETAILS
L1.1 – L2.3	LANDSCAPING

- SC-4 LAYOUT OF WORK:** Control lines and master benchmarks will be furnished by the Owner. The Contractor will lay out work and will be responsible for all measurements in connection therewith.
- SC-5 OBSERVATIONS AND TESTS:** Before acceptance of the whole or any part of the work, it shall be subjected to observation and tests to determine it is in accordance with the plans and

specifications. The Contractor will be required to maintain all work in a first-class condition for a 30-day operating period after the same has been completed as a whole and the Engineer has notified the Contractor in writing the work has been finished. The Owner shall pay for all initial testing. Retesting will be the responsibility of the contractor. Contractor shall engage a mutually acceptable laboratory or qualified individual to conduct the tests in accordance with these specifications. No portion of the work will be accepted until tests prove it has been satisfactorily completed. The Contractor shall give the Project Engineer or Project Representative a minimum of 48-hours' notice for all required observations or tests.

**SC-6 BONDS:** The Performance Bonds in the amount of 100% of the contract amount and Payment Bonds in the amount of 100% of the contract amounts shall be furnished in accordance with Article 5 of the General Conditions.

**SC-7 CONTRACTOR'S AND SUBCONTRACTOR'S INSURANCE:** The contractor shall agree to hold harmless, indemnify and defend Florence County, its agents and employees from any claims for property damage or personal injury (including death resulting therefrom). Such claims include, but are not limited to, actual, consequential, incidental or punitive damages.

- a. The contractor shall agree to maintain sufficient comprehensive general liability insurance, naming Florence County as additional insured in the amounts of \$1,000,000.00 per occurrence and \$1,000,000.00 per person. Proof of such insurance shall be given to the Florence County Procurement Office by an appropriate certificate-of-insurance issued by the contractor's insurance agent.
- b. Further, the contractor shall agree to insure prior to commencement of work on the project (job), all subcontractors, agents, assigns or employees of prime contractor and subcontractor shall agree to hold harmless, indemnify and defend the Florence County, South Carolina, its agents and employees from any claims for property damage or personal injury (including death resulting therefrom). Such claims include but are not limited to, actual, consequential, incidental or punitive damages. Further, prior to commencement of work on the project (job), the contractor shall insure that all subcontractors, agents or assigns of the contractor, maintain sufficient comprehensive general liability insurance, naming the Florence County, South Carolina, as additional insured, in the amounts of \$1,000,000.00 per occurrence and \$1,000,000.00 per person. Proof of such insurance shall be given to the Procurement Officer by an appropriate certificate-of-insurance issued by applicable entity's insurance agent.
- c. With regards to comprehensive general liability insurance, claims may be made during or after the term or terms of the contract agreement.
- d. Vehicle liability insurance with minimum combined single limits of \$1,000,000.00 per occurrence shall be maintained by the contractor.
- e. The contractor shall obtain and maintain, during the life of the contract agreement, workers' compensation and employer's liability insurance for all employees to be engaged in services on this project under this agreement in an amount not less than the minimum allowed by South Carolina law, and in case any such services are sublet, the contractor shall require the subcontractor(s) similarly to provide workers' compensation and employer's

REFERENCE ONLY

liability insurance for all of the subcontractor's employees to be engaged in such services.

- SC-8 HOLD HARMLESS CLAUSE:** The Contractor agrees to hold harmless, indemnify and defend the Owner and its agents, architects, engineers and employees from and against any and all claims, losses, damages, demands, causes of action and any an all related costs and expenses, of every kind and character, growing out of, incidental to, or resulting directly or indirectly from the Contractor's performance of the work described herein, whether such loss, damage, injury, or liability is contributed to by the negligence of the Owner, its agents, architects, engineers, or employees, except the Contractor shall have no liability for damages or the costs incidental thereto caused by the sole negligence of the Owner, its agents, architects, engineers, or employees. The Contractor will require any and all subcontractors to conform with the provisions of this clause prior to commencing any work and agrees to ensure this clause is in conformity with the insurance provisions of the contract.
- SC-9 CONTRACTOR'S STATUS:** It is agreed the Contractor shall occupy the status of an Independent Contractor and the Contractor's employees are not employees of the Owner.
- SC-10 CONTRACTOR'S AFFIDAVIT:** Upon completion of the work and prior to final payment and settlement of all sums due hereunder, Contractor will furnish to Owner a Contractor's Affidavit in the usual form submitted by Contractor under the laws of the State of South Carolina to the effect all bills for labor, materials and services in connection with said contract have been paid in full, acknowledging receipt of the contract price and averring there are no outstanding claims under said contract which could become a lien on the real estate arising out of said contract.
- SC-11 RESIDENT PROJECT ENGINEER:** The Owner reserves the right to furnish a Resident Project Engineer as deemed necessary to insure the Project quality control and conformance to Plans and Specifications, who will act as the Owner's Representative on the Project and will have the authority of the Engineer as set forth in the Contract Documents.
- SC-12 BARRICADES, DANGER AND WARNING SIGNS:** The Contractor shall install and maintain barricades, suitable and sufficient lights, danger signals, signs, and other traffic control devices and shall take all necessary precautions for the protection of the work and safety of the public. Lanes closed to traffic shall be protected by effective barricades, lighted during hours of darkness. Suitable warning signs shall be provided to control, direct traffic, and warn pedestrians. Upon completion all barricades, signs and the like shall be removed.
- SC-13 TOOLS, PLANT AND EQUIPMENT:** If at any time before the commencement or during the progress of the work, tools, plant or equipment appear to the Engineer to be insufficient, inefficient or inappropriate to secure the quality of the work required or the proper rate of progress, the Engineer may order the Contractor to increase their efficiency, to improve their character, to augment their number, or to substitute new tools, plant, or equipment, as the case may be, and the Contractor must conform to such order; but a failure of the Engineer to demand such increase of efficiency, number, or improvement shall not relieve the Contractor of its obligation to secure the quality of work and the rate of progress necessary to complete the work within the time required by the contract to the satisfaction of the Owner.

**SC-14 ACCIDENTS:** The Contractor shall provide, at the site, such equipment and medical facilities as are necessary to supply first-aid service to anyone who may be injured in connection with the work. The Contractor must report in writing to the Engineer all accidents whatsoever arising out of, or in connection with, the performance of the work, whether on or adjacent to the site, which causes death, personal injury or property damages, giving full details and statement of witnesses. In addition, if death or serious injuries or serious damages are caused, the accident shall be reported immediately by telephone or messenger to both the Contractor and any subcontractor on account of any accident, the Contractor shall promptly report the facts to the Engineer, giving full details in writing of the claim. The Contractor shall advise its superintendent and foreman, who are on the site of the work, the name of the hospital and phone number and the name and phone number of the doctor to use in case of an accident.

**SC-15 SANITARY PROVISIONS:** The Contractor shall provide temporary sanitary facilities for the use of the workmen during the progress of the work. The sanitary facilities shall conform to the requirements of the County health Engineer. All facilities shall be removed at the completion of the contract.

**SC-16 MODIFICATION OF QUANTITIES:** The itemized quantities shall be considered by the Contractor as the quantities required to complete the work for the purpose of bidding. Should actual quantities required in the construction of the work be greater or less than the quantities shown on the items, an amount equal to the difference in quantities at the unit prices for the item will be added to or deducted from the contract price.

When itemized quantities are not given in the Proposal, the work shown on the plans or specified shall be considered by the Contractor to be included in the contract for the lump sum prices bid.

**SC-17 RESPONSIBILITY REGARDING EXISTING UTILITIES AND STRUCTURES:** The existence and location of underground utilities will be investigated and verified in the field by the Contractor before starting work. The Contractor shall call for underground utility locations. Underground utilities location service can be contacted at 1-888-721-7877. The location of all known interferences based on the best information available has been shown on the drawings, but this information may not be complete. Excavation in the vicinity of existing structures and utilities shall be carefully done by hand. The Contractor shall be held responsible for any damage to and for maintenance and protection of existing utilities and structures. The Contractor is responsible for coordinating with the utility companies any relocation, adjustment, or replacement of utility facilities.

**SC-18 INTERRUPTION OF UTILITY SERVICE:** The Contractor's operations shall be conducted to interfere as little as possible with utility services. Any proposed interruption by the Contractor must be accepted in advance by the Engineer.

**SC-19 OMISSION:** The drawings and specifications shall both be considered as a part of the contract. Any work and material shown in the one and omitted in the other or described in the one and not shown in the other, or which may fairly be implied by both or either, shall be furnished and performed as though shown in both, in order to give a complete and first-class job.

**SC-20 MEASUREMENT AND PAYMENT:** Measurement and payment shall be made for the units and at the lump sum contract prices shown on the Bid Schedule. Direct payment shall only be

made for those items or work specifically listed in the proposal and the cost of any other work must be included in the contract price for the applicable items to which it relates.

**SC-21 "OR EQUIVALENT," CLAUSE:** Although the plans and specifications make reference to particular manufacturers and model numbers for various products, such reference is made only to establish function and quality of such products. If it is desired to use materials or equipment of trade names or of manufacturer's names that are different from those mentioned in the contract documents, information pertaining to such items must reach the hands of the Engineer at least 10 days prior to the date set for the opening of bids. The burden of proving equality of a proposed substitute to an item designated by trade name or by manufacturer's name in the contract document rests on the party submitting the request for acceptance. The written application for review of a proposed substitute must be accompanied by technical data that the party requesting review desires to submit in support of its application. The Engineer will give consideration to reports from reputable independent testing laboratories, verified experience records showing the reputation of the proposed product with previous users or any other written information that is reasonable in the circumstances. The application to the Engineer for review of a proposed substitute must be accompanied by a schedule setting forth in what respects the material or equipment submitted for consideration differs from the materials or equipment designated in the contract documents. The degree of proof required for acceptance of a proposed substitute as equivalent to a named product is the amount of proof necessary to convince the Engineer beyond all doubt. To be acceptable, a proposed substitute must, in addition, meet or exceed all express requirements of the contract documents.

If submittal is accepted by the Engineer, an addendum will be issued to all prospective bidders at least five days prior to the date set for the opening of bids.

The Engineer shall be the final judge on questions of similarity and equality.

**SC-22 SAFETY AND HEALTH REGULATIONS:** The Contractor shall comply with the Department of Labor Safety and Health Regulations for Construction promulgated under the Occupational Safety and Health Act of 1970 as amended through January 1, 2004 (PL 91-596) and under Section 107 of the Contract Work and Safety Standards Act (PL 91-54). The regulations are administered by the Department of Labor and the Contractor shall allow access to the project to personnel from that Department.

**SC-23 RECORD DATA AND DRAWINGS:** The Contractor shall keep accurate, legible records of the locations, types, and sizes of sanitary lines, service laterals, manholes, cleanouts, water lines, fittings, valves, hydrants, drainage pipes, drainage structures, and other related work performed under this project. Where proposed and existing utilities cross, the Contractor shall measure and record the horizontal location and vertical separation between each crossing. Separation shall be measured between exteriors of pipes. On a set of project prints provided by the Owner, the Contractor shall prepare a set of "record" drawings from the data stated above. The horizontal locations of all portions of items installed on this project shall be accurately tied down to features that are physical and visible, such as property corner markers and/or permanent type structures. Invert elevations of all manholes, storm sewers and structures including stormwater detention pond volume, sanitary sewers and lift stations shall be clearly indicated. These "record" drawings shall be kept clean and dry and maintained in a current state with the progress of the work. If at any time, a copy of this plan or portion of it is requested by the Owner, such copy shall be made available within 24-hours after the request is made.

Before final acceptance of the completed installation and final payment by the Owner, the Contractor shall deliver to the Engineer, four sets of "Record" Drawings accurately depicting the horizontal and vertical as-built data described in the above paragraph. "Record" drawings for the items installed on this project shall be certified by a licensed surveyor, other than Thomas & Hutton, registered in South Carolina. The size of the drawings shall be 24" x 36". The "Record" drawings shall have a coordinate system based on the South Carolina State Plane Coordinate System, North American Datum of 1983 (NAD83). Elevations shall be based on the North American Vertical Datum of 1988 (NAVD 88). All measurements and coordinates shown shall use the U.S. Survey flood definition. Coordinates shall be shown on all drainage structures, sanitary sewer manholes, storm manholes/boxes, stormwater detention pond volume, stormwater valve boxes/vaults, valve manholes, valves, fire hydrants, fittings, and all other related work performed under this contract. Vertical data including but not limited to, structure and manhole frame and inverts, pipe inverts, lift station frame, inverts, control levels, bottom, site grading, and as-built grading shall be shown. In addition to the "Record" drawings, Contractor shall deliver to Engineer electronic AutoCAD (v. 14 or later) files of all the data described above on a CD-ROM.

**SC-24 PROPERTY CORNERS:** The Contractor shall be responsible for restoring any property corners or monuments disturbed during construction. They shall be restored by a professional surveyor registered in the State of South Carolina.

**SC-25 VIDEO:** A video showing existing site conditions shall be made by the Contractor prior to start of construction. Contractor shall provide Owner and Engineer a copy of the video. Contractor is encouraged to record any existing damaged facilities that could be questioned later by property owners. A written or recorded narrative shall be provided with the video. Engineer shall be notified 72-hours in advance making the video. Contractor is responsible for all costs associated with video and shall be considered a subsidiary part of the contract.

**SC-26 ARCHEOLOGICAL MATERIALS:** If archeological materials are encountered during construction, the procedures codified at 33 CFR 800.13(b) will apply and FDA, the South Carolina State Historic Preservation Office, and the Catawba Indian Nation shall be contacted immediately. Archeological materials consist of any items, fifty years or older which were made or used by man. These items include, but are not limited to, stone projectile points (arrowheads), ceramic sherds, bricks, worked wood, bone and stone, metal and glass objects, and human skeletal remains.

**DOCUMENT 00815****SUPPLEMENTARY CONDITIONS**

These Supplementary Conditions amend or supplement the Standard General Conditions of the Construction Contract (EJCDC C-700, 2007 Edition) and other provisions of the Contract Documents as indicated below. All provisions that are not so amended or supplemented remain in full force and effect.

SC-1 The terms used in these Supplementary Conditions which are defined in the Standard General Conditions of the Construction Contract (EJCDC C-700, 2007 Edition) have the meanings assigned to them in the General Conditions.

SC-2.05.A.4 Add the following new paragraph to the General Conditions after paragraph 2.05.A.3:

4. "A schedule of anticipated shipping dates for materials and equipment. It is intended that equipment and materials be so scheduled as to arrive at the job site just prior to time for installation to prevent excessive materials on hand for inventory and necessity for extensive storage facilities at the job site."

SC-5.04.B.7 Add the following new paragraph to the General Conditions after paragraph 5.04.B.6:

7. Bonding surety shall be located in the state in which the work is being performed.

**REFERENCE ONLY**

The Contractor shall not commence work under this contract until it has obtained all the insurance required under this paragraph and such insurance has been accepted by the Owner, nor shall the Contractor allow any Subcontractor to commence work on its subcontract until the insurance required of the Subcontractor has been so obtained and accepted.

- a. Compensation and Employer's Liability Insurance: The Contractor shall take out and maintain during the life of the contract, the statutory Worker's Compensation and Employer's Liability Insurance for all of its employees to be engaged in work on the project under the contract and, in case such work is sublet, the Contractor should require the Subcontractor similarly to provide Worker's Compensation and Employer's Liability Insurance for all the latter's employees to be engaged in such work.
- b. Bodily Injury Liability and Property Damage Liability Insurance: The Contractor shall take out and maintain during the life of the contract, Bodily Injury Liability and Property Damage Liability Insurance. The policy shall protect Contractor and any Subcontractor performing work covered by the contract from claims for damages or personal injury, including accidental death, a well as from claims for property damage, which may arise from

operations under the contract, whether such operations be by Contractor, Subcontractor, or by anyone directly or indirectly employed by either of them and the amount of such insurance should be not less than:

- (1) Bodily Injury Liability Insurance, in an amount not less than \$1,000,000.00 for injuries, including wrongful death to any one person and subject to the same limit for each person in an amount not less than \$2,000,000.00 on account of one accident. Contractual liability should be endorsed on the policy.
- (2) Property Damage Insurance in an amount not less than \$1,000,000.00 for damages on account of any one accident, and in an amount not less than \$2,000,000.00 for damages on account of all accidents.

- c. Builder's Risk Insurance (Fire and Extended Coverage): The Contractor shall have adequate fire and standard extended coverage, with a company or companies acceptable to the Owner, in force on the project.

The provisions with respect to Builder's Risk Insurance shall in no way relieve the Contractor of its obligation of completing the work covered by the Contract.

- d. Proof of Carriage of Insurance: The Contractor shall furnish the Owner with certificates showing the type, amount, class of operations, effective dates, and date of expiration of policies. Such certificates shall contain substantially the following statement: "The insurance covered by this certification shall not be canceled or materially altered, except after 10-days written notice has been received by the Owner."

REFERENCE ONLY

SC-6.02.B Add the following:

The Contractor shall provide in writing any requests to work on weekends. Requests shall be submitted to the Owner and Engineer for consideration a minimum of 48-hours prior to the requested weekend.

SC-6.08 Add the following:

The Contractor shall not proceed until all encroachment permits, curb cut permits, highway crossing permits, and railroad crossing permits have been secured. Contact Owner to ascertain status of permits.

SC-6.09.D Add a new paragraph after paragraph 6.09.C of the General Conditions that reads as follows:

- "D. The Contractor shall comply with the Department of Labor Safety and Health Regulations for Construction promulgated under the Occupational Safety and Health Act of 1970 as amended through January 1, 2004 (PL

91-596) and under Section 107 of the Contract Work and Safety Standards Act (PL 91-54). The regulations are administered by the Department of Labor and the Contractor shall allow access to the project to personnel from that Department.

The Bidder's attention is directed to the fact all applicable State laws, municipal ordinances, and the rules and regulations of all authorities having jurisdiction over construction of the project shall apply to the contract throughout and they will be deemed to be included in the contract the same as though herein written in full.

The Contractor shall keep fully informed of all laws, ordinances and regulations of Federal, State, City and County, in any manner affecting those engaged or employed in the work, or the materials used in the work, or in any way affecting the conduct of the work, and of all orders and decrees of bodies or tribunals having any jurisdiction or authority over same. Contractor shall at all times, observe and comply with all such existing and future laws, ordinances, and regulations."

SC-6.12.B Add a new paragraph after paragraph 6.12.A of the General Conditions that is to read as follows:

"B. Record Data Drawings:

1. The Contractor shall keep accurate, legible records of the locations, types, and sizes of sanitary lines, service laterals, manholes, cleanouts, water lines, fittings, valves, hydrants, drainage pipes, drainage structures, and other related work performed under this project. Where proposed and existing utilities cross, the Contractor shall measure and record the horizontal location and vertical separation between each crossing. Separation shall be measured between exteriors of pipes. On a set of project prints provided by the Owner, the Contractor shall prepare a set of "record" drawings from the data stated above. The horizontal locations of all portions of items installed on this project shall be accurately tied down to features that are physical and visible, such as property corner markers and/or permanent type structures. Invert elevations of all manholes, storm sewers and structures including stormwater detention pond volume, sanitary sewers and lift stations shall be clearly indicated. These "record" drawings shall be kept clean and dry and maintained in a current state with the progress of the work. If at any time, a copy of this plan or portion of it is requested by the Owner, such copy shall be made available within 24-hours after the request is made.
2. Before final acceptance of the completed installation and before final payment by the Owner, the Contractor shall deliver to the Engineer a completed set of "record" drawings accurately depicting the data described above. The horizontal and vertical locations as shown on the "record" drawings for the items installed on this project shall be certified by a licensed surveyor, other than Thomas & Hutton, registered in the State in which the project is located. "Record" Drawings shall be submitted on a marked-up set of project

construction prints or electronically. Thomas & Hutton shall prepare original "record" drawings from the submitted data. When completed, Thomas & Hutton shall have the licensed surveyor stamp and sign the original "record" drawings before making copies available to the Owner or other appropriate agencies."

SC-6.13.A.3 Add the following:

"Safely guard the Owner's property from damages, injury, or loss in connection with this contract. Contractor shall at all times guard and protect its own work and all materials of every description both before and after being used in the work.

Contractor shall provide any enclosing or special protection from weather deemed necessary by Engineer without additional cost to the Owner. Partial payments under the contract will not relieve the Contractor from responsibility for protection of material, work, and property."

SC-9.02.C Add a new paragraph after paragraph 9.02.B of the General Conditions that is to read as follows:

"C. If at any time before the commencement or during the progress of the work, tools, plant or equipment appear to the Engineer to be insufficient, inefficient, or inappropriate to secure the quality of the work required or the proper rate of progress, the Engineer may order the Contractor to increase their efficiency, to improve their character, to augment their number, or to substitute new tools, plant or equipment as the case may be, and the Contractor must conform to such order; but a failure of the Engineer to demand such increase or efficiency, number, or improvements, shall not relieve the Contractor's obligation to secure the quality of work and the rate of progress necessary to complete the work within the time required by this contract to the satisfaction of the Owner."

SC-9.05 Add the following sentence at the end of paragraph 9.05 of the General Conditions:

"Owner and Engineer have the right to reject defective materials. Defective materials shall not be used in the work."

SC-13.03.A Add the following sentences to paragraph 13.03.A of the General Conditions:

"The Contractor will be required to maintain all work in a condition acceptable to the Engineer for a 30-day operating period after the same has been completed as a whole, and the Engineer has notified the Contractor in writing that the work has been finished. The Contractor shall give the Project Engineer or Project Representative a minimum of 48-hours' notice for all required observations and tests."

### **END OF SUPPLEMENTARY CONDITIONS**

**INDEX TO**  
**SECTION 01011**  
**SUMMARY OF WORK**

<b>Paragraph</b>	<b>Title</b>	<b>Page</b>
<b>PART 1 – GENERAL</b>		
1.1	Section Includes	01011-1
1.2	Contract Description	01011-1
1.3	Work Required	01011-1
1.4	Contract Drawings	01011-2
1.5	Contract Technical Specifications	01011-2
1.6	Work Schedule	01011-2

**PART 2 – PRODUCTS**

Not Used

**PART 3 – EXECUTION**

Not Used

**REFERENCE ONLY**

**SECTION 01011**  
**SUMMARY OF WORK**

**PART 1 – GENERAL**

**1.1 SECTION INCLUDES**

- A. Contract Description.
- B. Work required by Contract.
- C. Contract Drawings.
- D. Contract Technical Specifications.
- E. Work Schedule.

**1.2 CONTRACT DESCRIPTION**

- A. Contract Type: 00506 - Agreement

**1.3 WORK REQUIRED**

- A. Consists of Contractor furnishing all labor, materials, tools, equipment and incidentals to complete the Work generally described below:
  - 1. Improvements to approximately 18-acre parcel within the Florence County Industrial Park East, Florence County, South Carolina. The development will include an approximately 100,200 SF mass graded pad and site improvements, ±635 linear feet of asphalt paved roadway, and asphalt paved dedicated right-turn lane, including gravel turnaround, with center concrete curb and gutter island, clearing and grubbing; grading; erosion control; ditched storm drainage system with RCP culverts with wet stormwater detention pond; ±80 of 12" DIP water line extension, ±810 linear of 12" PVC - C900 - DR 18 water line extension, jack & bore ±45 linear feet of 20" steel casing; ±3,734 linear feet of 12" PVC – SDR 26 sewer service line.
- B. All work shall be performed as shown on the Drawings and as described in the Contract Documents and Technical Specifications.
- C. All work shall comply with standards described by the Department of Labor, Occupational Safety and Health Administration, 29 CFR Part 1926, Subpart P, latest revision.

**1.4 CONTRACT DRAWINGS**

Sheet Number	Sheet Title
CS	COVER SHEET
G0.1	GENERAL NOTES & INDEX
EX1.1 – EX1.3	EXISTING CONDITIONS PLAN

C1.1	SITE PLAN
EC0.1	EROSION CONTROL NOTES
EC0.2	EROSION CONTROL CHARTS
EC1.1 - EC3.2	EROSION CONTROL PLAN
EC4.1 – EC4.3	EROSION CONTROL DETAILS
C2.1	WATER PLAN
C2.2-C2.5	SEWER PLAN & PROFILE
C2.6 – C2.7	UTILITY DETAILS
C3.0	PAVING, GRADING, & DRAINAGE PLAN
C3.1	ROAD PLAN AND PROFILE
C3.2	OFF-SITE ROADWAY PLAN
C3.3	TYPICAL ROADWAY SECTIONS
C3.4	DRAINAGE PROFILES
C5.0	STRIPING AND SIGNAGE PLAN
C5.1 – C5.2	SITE DETAILS
C6.1	CROSS SECTIONS
C7.1 – C7.2	TRAFFIC CONTROL DETAILS
L1.1 – L2.3	LANDSCAPING

### CONTRACT TECHNICAL SPECIFICATIONS

- A. As listed in the Table of Contents.

### 1.6 WORK SCHEDULE

- A. Construct Work in stages to accommodate Owner's requirements during the construction period, coordinate construction schedule and operations with Engineer.

### PART 2 – PRODUCTS

Not used

### PART 3 – EXECUTION

Not used

**END OF SECTION**

**SECTION 01012**

**SOIL INVESTIGATION DATA FOR BIDDERS**

<b>Paragraph</b>	<b>Title</b>	<b>Page</b>
<b>PART 1 – GENERAL</b>		
1.1	Description	01012-1
1.2	Soil Investigation Data	01012-1

**PART 2 – PRODUCTS**

See attached report.

**PART 3 – EXECUTION**

None in this Section

**REFERENCE ONLY**

**SECTION 01012****SOIL INVESTIGATION DATA FOR BIDDERS****PART 1 – GENERAL****1.1 DESCRIPTION**

- A. This section includes subsurface data logs for information only.

**1.2 SOIL INVESTIGATION DATA**

- A. Subsurface data logs are available for information only. Actual conditions may vary. If bidders are not satisfied with accuracy and completeness of all available data, they are at liberty to make borings or perform soil investigation work for their own use at its expense. If Contractor chooses to perform their own investigation, work shall be coordinated with the Engineer. Any results from Contractor's investigation shall be shared promptly with the Engineer. Owner reserves the right to share Contractor's investigation data with other potential bidders if information could affect bidding process.
- B. The boring logs and test results are for information of the Contractor. Owner and Engineer assume no responsibility for the information.

**PART 2 – PRODUCTS**

See attached report.

**PART 3 – EXECUTION**

None this Section.

**END OF SECTION**



Report of Geotechnical Exploration  
Florence Industrial Park  
Florence, South Carolina  
S&ME Project No. 1339-20-035

**REFERENCE ONLY**

PREPARED FOR:

**Thomas & Hutton**  
1501 Main Street, Suite 760  
Columbia, South Carolina 29201

PREPARED BY:

**S&ME, Inc.**  
2327 Prosperity Way, Suite 9  
Florence, SC 29501

**November 12, 2020**



November 12, 2020

Thomas & Hutton  
1501 Main Street, Suite 760  
Columbia, South Carolina 29201

Attention: Ross Oakley, P.E.

Reference: **Report of Geotechnical Exploration  
Florence Industrial Park**  
Florence, South Carolina  
S&ME Project No. 1339-20-035

Dear Mr. Oakley:

S&ME, Inc. has completed the subsurface exploration for the referenced project after receiving signed authorization to proceed on October 2, 2020. Our exploration was conducted in general accordance with our Proposal No. 13-2000420, dated October 2, 2020.

The purpose of this study was to characterize the surface and subsurface soils on the proposed site, and to provide geotechnical recommendations for site preparation, earthwork and compaction, foundation support for the proposed structures, and pavement section construction.

**REFERENCE ONLY**

This report describes our understanding of the project, presents the results of the field exploration, laboratory testing, and engineering analysis, and discusses our conclusions and recommendations based upon these considerations.

S&ME, Inc. appreciates this opportunity to be of service to you. Please call if you have questions concerning this report or any of our services.

Respectfully submitted,

**S&ME, Inc.**

Jonathan M. Prevatte  
Geotechnical Staff Professional



Ronald P. Forest, Jr. P.E.  
Senior Engineer  
SC Registration No. 21248





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## 1.0 Executive Summary

For your convenience, this report is summarized in outline form below. This brief summary should not be used for design or construction purposes without thoroughly reviewing the information presented in the remainder of this report.

- 1. Soil Conditions:** Most of the site consists of clear cut areas with new growth vegetation throughout. Organic topsoil ranged in thickness from 6 to 12 inches at our test locations. A layer of wood chips was encountered at test location HA-8 to a depth of 1 foot. Beneath the wood chips at test location HA-8 and beneath the topsoil at the remaining test locations, very loose to loose sands and soft clays (Stratum I) were encountered to depths ranging from 5 to 21 feet below the ground surface. Underlying the Stratum I soils at test locations C-1 through C-6, C-8 through C-11, C-13, and C-14, medium dense to very dense sands (Stratum II) were encountered to a depth of about 15 feet below the ground surface in soundings C-7 to C-10 and to the maximum exploration depths of 20 to 30 feet in the remaining soundings. Stratum II was not encountered at test location C-12. Underlying Stratum II at test location C-7 beginning at a depth of about 15 feet, we encountered very soft fine grained soils (Stratum IIA) to the maximum exploration depth of 30 feet in sounding C-7. This stratum was not encountered at the other test locations. Underlying Stratum II at test location C-10 and underlying Stratum I at test location C-12, a stratum of soft clay soils (Stratum IIB) was encountered to the maximum exploration depth of 30 feet in those soundings. Stratum IIB was not encountered at the other test locations.
- 2. Groundwater:** Based on pore pressure readings measured in the cone soundings, the groundwater level at the time of our assessment was interpreted to range from 8 to 11 feet below the ground surface across the site. Groundwater levels within the hand auger borings ranged from above the ground surface to about 3 feet, with the shallowest water conditions observed near the western portion of the site in the vicinity of test locations C-7 and C-8. Groundwater was not encountered in the hand auger borings at test locations HA-1, HA-2, C-9, and C-12 through C-14. Based on the soil stratigraphy, the shallow groundwater conditions indicate that this site is susceptible to shallow perched water conditions, where water from runoff and precipitation becomes trapped on top of and within the upper sandier soils overlying less permeable clayey soils. Groundwater levels may fluctuate seasonally at the site, being influenced by rainfall variation and other factors. Site construction activities can also influence groundwater elevations.
- 3. Site Drainage and Preparation:** The site should be stripped of vegetation, topsoil, and rootmat. For budgeting purposes, we recommend that stripping allowance of at least 12 inches be considered. Based on significant areas of ponded water on the site and the shallow groundwater depths measured during our exploration, and dependent upon weather conditions when grading takes place, perched groundwater will likely be a significant concern for development of this site. The near-surface soils are clayey and relatively impermeable. During periods of wet weather, a perched groundwater condition is likely to develop, similar to the site conditions documented at the time of the exploration. For these reasons, ***it is critical that drainage be established early in the grading phase of the project; we recommend that the ditching be installed several months prior to beginning site grading.*** Such drainage will likely consist of a series of gravity-drained ditches around the perimeter of the construction



areas and “finger” ditches spaced at regular intervals within the construction area. In some cases, it may be advisable that these ditches be converted to permanent underdrains by the additions of fabric wrapped washed gravel. The ditches should be excavated to such a depth that would allow a minimum separation of at least 3 feet between planned subgrade elevations and the ground water elevation. Ditches should have sufficient relief to facilitate gravity flow. Groundwater levels should be re-evaluated by an S&ME Geotechnical Engineer just prior to beginning the grading phase of the project to allow us to better refine our drainage recommendations. Following site drainage and prior to new fill placement, the stripped subgrade soils should be densified in-place with a large roller operated on static (non-vibratory) mode to prevent wicking of moisture up into the subgrade soils. The subgrade should be proofrolled by the contractor under the supervision of a representative of the Geotechnical Engineer (S&ME), and tested for proper compaction by an S&ME soils technician. Some overexcavation of soils that will not sufficiently densify may be required.

4. **Liquefaction Risk:** Based on the apparent age and soil structure of the subsurface soils and the previously completed site-specific dynamic response analysis, liquefaction of the soil profile during seismic shaking was determined not to be a significant concern at this site, considering the anticipated ground accelerations associated with the design magnitude earthquake; therefore, Site Class F is not applicable.
5. **Seismic Site Class and Design Category:** Cone sounding data and shear wave velocity field test data indicates that this site is best described as IBC 2018 seismic Site Class D. Based on the soil profile, the following Site Class D seismic design parameters are applicable:  $S_{DS} = 0.32g$ ,  $S_{D1} = 0.18g$ , and Mapped MCE Geometric Mean Peak Ground Acceleration ( $PGA_M$ ) = 0.24g. For structures in Seismic Risk Category I, II, or III, this indicates Seismic Design Category C.
6. **Shallow Building Foundations:** Considering maximum structural loads of 150 kips per column and 6 kips per linear foot of wall, and about 300 pounds per square foot (psf) of uniformly applied area load to represent the weight of new fill soil and the applied floor slab loading (including the self-weight of the slab), a shallow foundation system appears feasible for support of the initial planned speculative building site with acceptable magnitudes of post-construction static settlement. Note that this bearing pressure may not be available in other areas of the industrial park, particularly in the areas of soundings C-7, C-10, C-11, and C-12.
  - A net available soil bearing pressure of up to 2,500 pounds per square foot (psf) may be used for spread footing design of the speculative building, provided that our estimated post-construction static settlement magnitudes of up to 1 inch total and up to ½ inch differential settlement are considered tolerable, and the recommendations in this report are followed.
  - Careful evaluation of the bearing conditions within the open footing excavations will be very important during construction due to the loose conditions observed in the upper soils of Stratum I. Some overexcavation and replacement within the upper few feet of the immediate bearing soils within some of the footing excavations may be necessary, but may vary from footing to footing; where this determined to be required by penetrometer testing, the overexcavated soils should be replaced with compacted clean, crushed, coarse gravel, such as SCDOT No. 57 or No. 67 stone. The owner should include a budget contingency item in the project cost for undercutting and replacing footing bearing soils with No. 57/67 stone.



**Note:** Only lightly loaded structures (50 kips or less column loads and 3 kips or less wall loads) should be planned in the vicinity of test sounding C-7 where a thick deposit of sensitive fine-grained soils was encountered. Structures with column loading greater than 50 kips may experience total static settlement magnitudes of 1 ½ inches or more. This area of the site is not favorable for development. Additional geotechnical exploration should be performed for any future buildings other than the initial speculative building to more thoroughly explore the subsurface conditions.

- 7. Grade Slabs:** Soil-supported thin slabs on grade may be designed using a modulus of subgrade reaction (k) of 175 pci, provided that the subgrade is prepared as recommended in this report. A capillary break layer consisting of at least 6 inches of granular materials should be placed immediately beneath the floor slab, to separate it from the silty/clayey sand subgrade.
- 8. Pavements:** For light-duty flexible pavement areas not subject to truck traffic, we recommend the following pavement section: 2 inches of Type C hot mixed asphalt (HMA) surface course over 8 inches of compacted graded aggregate base course. For heavy-duty flexible pavement areas where heavy truck traffic is applied (such as the main industrial park entrance road), we recommend the following pavement section: 2 inches of Type B Surface Course HMA over 2 inches of Type B Intermediate Course HMA over 10 inches of compacted graded aggregate base course (GABC). For heavy-duty Portland cement concrete (PCC) with steel reinforcement (dowels) at the joints, subject to truck traffic, we recommend the following minimum pavement section: 8 inches of 4,000 psi PCC over 6 inches of compacted graded aggregate base course.

**REFERENCE ONLY**



## 2.0 Introduction

The purpose of this exploration was to obtain subsurface information to allow us to characterize the subsurface conditions at the site and to develop recommendations concerning grading, foundation design, and other related construction issues. This report describes our understanding of the project, presents the results of the field exploration and laboratory testing, and discusses our conclusions and recommendations.

A site plan showing the approximate test locations is included in Appendix I. The boring logs, a discussion of the field exploration procedures, and a legend to soil classification and symbols is included in Appendix II. The results of the laboratory testing are included in Appendix III.

## 3.0 Site and Project Description

### 3.1 Project Information

Project information was provided via email correspondence from Ross Oakley, P.E. (Thomas & Hutton) to Ron Forest, Jr., P.E. (S&ME, Inc.) on September 18, 2020. In that email, Mr. Oakley requested that we provide a proposal for a geotechnical exploration of the project site and provided the following project documents:

- "Phase I On-site Roadway and Water System Improvements at the Florence County Industrial Park", prepared by Thomas & Hutton, dated September 10, 2020.
- "Phase I Off-site Improvements at the Florence County Industrial Park", prepared by Thomas & Hutton, dated September 10, 2020.
- "Certified Economic Development Sites Program – Winona Site +/- 325 Acres Florence County, South Carolina", prepared by Mactec, dated February 4, 2004.
- "Speculative Building Mass Grading Improvements at the Florence County Industrial Park", prepared by Thomas & Hutton, dated September 10, 2020.

In email correspondence with Mr. Oakley on September 23, 2020, Will Kannon (S&ME) provided a geotechnical exploration scope and proposed test location layout to include sixteen (16) test locations to be performed at the site, as shown on the attached "Proposed Test Location Sketch".

### 3.2 Site and Project Description

The project site is located at the Florence Industrial Park site, which is the previous "Winona Site", located on U.S. Highway 76 just west of the intersection with East Old Marion Highway (State Road S-21-24) in Florence, South Carolina.

We understand that planned site improvements consist of the construction of a new speculative building, site pavements, and detention basins. The initial speculative building will have a footprint of about 100,000 square feet (SF) in plan area and will likely be one-story in height. We have not been provided with specifics relating to the proposed construction; however, for purposes of this report, we assume the structure may be a high-bay



structure and will consist of steel interior framing with exterior tilt-up concrete panels. A site vicinity map is included as Figure 1 in Appendix I.

### **3.3 Design Parameters**

#### *3.3.1 Structural Loading Information*

Structural loading information for this construction was not provided to us prior to issuance of this report; however, based on our experience with similar projects, we assume that the proposed initial speculative building structure may have maximum column loads of about 150 kips or less and wall loads of about 6 kips per linear foot or less, and that uniform floor slab area loading should be about 300 pounds per square foot.

Because actual load information was not provided to us and these loads were assumed values used in our bearing capacity and settlement analyses, the assumed loading information presented above should be reviewed by the project structural engineer and if actual column, wall, or area loads are found to be higher than those presented above, we should be given an opportunity to reevaluate settlement potential and recommended bearing pressure based on the revised loading scenarios.

#### *3.3.2 Settlement Tolerances*

We have not been provided with information relating to project settlement tolerances; therefore, we have assumed acceptable static settlement tolerances of 1 inch of total post-construction settlement and ½ inch of differential post-construction settlement.

#### *3.3.3 Grade Elevation Changes*

We have not been provided a grading plan prior to our preparing this proposal; however, we assume that planned elevations for the new facility may result in cuts or fills of 2 to 3 feet or less to achieve design final subgrade elevations for construction.

#### *3.3.4 Traffic Loading*

Traffic frequency and loading data was not provided prior to our issuing this report; however, our experience with similar projects, we estimate that site pavements may experience traffic consisting of the following vehicles, loading, and frequencies:

- Automobiles – 150 two-way trips per day, 365 days per year, for 20 years – average vehicle factor of 0.004, 18-kip Equivalent Single Axle Load (ESAL) per pass.
- Light Delivery Trucks – 10 two-way trips per day, 260 days per year, for 20 years – average vehicle factor of 0.5, 18-kip equivalent Single Axle Load (ESAL) per pass.
- Garbage Truck – 4 two-way trips per week, 52 weeks per year, for 20 years – average vehicle factor of 4.0, 18-kip ESALs per pass.
- Tractor Trailer – 50 two-way trips per day, 260 days per year, for 20 years – average vehicle factor of 3.0, 18-kip equivalent Single Axle Load (ESAL) per pass.



## 4.0 Exploration Program

### 4.1 Field Exploration

Between the dates of October 18<sup>th</sup> and October 22<sup>nd</sup>, 2020, representatives of S&ME, Inc. visited the site on several occasions. Using the information provided, we performed the following tasks.

1. We performed a site walkover, observing general features of topography, existing structures, ground cover, surface water, and surface soils at the project site.
2. We coordinated vegetation clearing efforts in conjunction with the clearing subcontractor to access test locations.
3. Following clearing, we explored the subsurface soils at 24 discrete test locations. Soil test locations were determined by S&ME personnel. The test locations were laid out on-site using a portable Global Positioning System (GPS). Using our engineering judgment, we divided the assigned test locations between several different subsurface data acquisition methods, including hand auger borings and Cone Penetration Test (CPT) soundings. See Figures 2 and 3 in Appendix I for sketches of the test locations.
4. We advanced 14 CPT soundings to depths ranging from 20 to 30 feet. In sounding, C-5, downhole shear wave velocity testing was performed at one-meter depth intervals to a depth of 29.8 feet at which refusal to advance was encountered.
5. We advanced 14 hand auger borings to a target depth of 4 feet each at each of the CPT sounding locations. Ten (10) additional hand auger borings (HA-1 through HA-10) were performed within the pavement areas to a target depth of 5 feet each. Dynamic cone penetrometer (DCP) testing was performed at regular depth intervals of approximately 1 foot each within hand auger borings HA-1 through HA-10 in general accordance with ASTM STP 399 procedures to help us estimate the relative density and consistency of the subgrade soils.
6. Disturbed soil samples were recovered from the hand auger borings for laboratory classification and were transported to our laboratory for further testing.
7. Groundwater levels within the hand auger borings were measured at the time of drilling. Groundwater levels within the CPT soundings were interpreted based upon pore pressure measurements.
8. Some of the soil cuttings within the upper 2 feet within the proposed pavement areas were collected to form two bulk samples for laboratory testing.

A brief description of the field exploration procedures performed, as well as soil classification legends, and the CPT sounding logs, SPT boring logs, and hand auger boring logs are attached in Appendix II.

### 4.2 Laboratory Testing

After the recovered soil samples were brought to our laboratory, a geotechnical professional examined and/or tested each sample to estimate its distribution of grain sizes, plasticity, organic content, moisture condition, color, presence of lenses and seams, and apparent geologic origin in general accordance with ASTM D 2488, "Standard Practice for Description and Identification of Soils (Visual-Manual Procedure)". The resulting classifications are presented on the hand auger boring logs and SPT boring logs, included in Appendix II. Similar soils were grouped into representative strata on the logs. The strata contact lines represent approximate boundaries between soil



types. The actual transitions between soil types in the field are likely more gradual in both the vertical and horizontal directions than those which are indicated on the logs.

We performed the following quantitative ASTM-standardized laboratory tests on several samples, to help classify the soils and formulate our conclusions and recommendations:

- Four grab samples and two bulk samples tested in general accordance with ASTM D 2216, "*Standard Test Methods for Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass*", to measure the in-situ moisture content of the soil.
- Four grab samples and two bulk samples tested in general accordance with ASTM D 1140, "*Standard Test Methods for Amount of Material in Soils Finer than No. 200 (75- $\mu$ m) Sieve*", to measure the percent clay and silt fraction.
- Four grab samples and two bulk samples tested in general accordance with ASTM D 4318, "*Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils*", to measure the plasticity of the soil.
- Two bulk samples tested for moisture-density relationship ("Proctor") using modified effort ASTM D 1557, "*Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft<sup>3</sup> (2,700 kN-m/m<sup>3</sup>))*" to characterize the compaction characteristics of the soil.
- One specimen from each of the two bulk samples re-compacted to approximately 95 percent of the modified Proctor maximum dry density and tested in general accordance with ASTM D 1883, "*Standard Test Method for California Bearing Ratio (CBR) of Laboratory-Compacted Soils*" to evaluate the subgrade support characteristics of the soils.

The laboratory test results and a brief description of the laboratory procedures for the above listed tests are attached to this report in Appendix III.

**REFERENCE ONLY**

## **5.0 Site and Surface Conditions**

This section describes the surface conditions observed during the exploration.

### **5.1 Ground Cover and Vegetation**

Most of the site was previously wooded with thick new growth vegetation. Standing water was observed throughout portions of the site, most notably within the vicinity of test locations C-7 and C-8 (see Figure 5-1 below).



Figure 5-1

		Date: 10/22/2020
		Photographer: J. Prevatte
<b>Location / Orientation</b>	Ponded water within the vicinity of test locations C-7 and C-8.	
<b>Remarks</b>	Water level about 6" deep average	

REFERENCE ONLY

Additional numerous isolated areas of ponded water were observed on the ground surface, along the western portion of the site.

## 5.2 Topsoil and Rootmat

Topsoil was encountered at all of the test locations with the exception of test location HA-8 where our hand auger boring encountered approximately 1 foot of wood chips from logging activities at the site. Topsoil encountered at the site ranged from about 6 to 12 inches in thickness. Topsoil is typically associated with the pedologic "O" horizon in USDA soil maps, which represents material containing less than about 50 percent mineral matter. The underlying "A" horizon soils are often also dark stained and to some degree visually similar to the "O" horizon, though containing substantially less organic matter. For purpose of describing subsurface conditions, boring



records include the designation “topsoil” on all samples containing apparent organic content. Topsoil and rootmat thickness maybe thicker in unexplored sections of the site, and in low-lying areas.

### **5.3 Local Geology**

The site is located in the Coastal Plain Physiographic Region of South Carolina. The Coastal Plain extends from the eastern limit of the Piedmont (“Fall Line”) eastward to the coast, and consists of a wedge-shaped deposit of ancient marine sediments of the Late Cretaceous Period and younger. Coastal Plain soils comprise interbedded layers of normally-consolidated and over-consolidated limestone, gravels, sands, silts, and clays. This deposit ranges in thickness from near zero at the Fall Line to thousands of feet at the coast. In the general site area, depth to crystalline metamorphic rock is roughly 250 meters.

A review of local geologic mapping indicates that the site area lies within an outcrop area of the Bear Bluff Formation (Tb), typically interlayered terrestrial clays, silts, and sands laid down near the end of the Pliocene age approximately 3 million years ago. At this site, the soils appear to be part of the fluvial facies of the Bear Bluff, representing archaic river terrace materials deposited by fluvial action in the Pee Dee River valley. These materials form a mantle which overlies much older calcareous soils below. The surface has been reworked to some degree by erosional processes over geologic time, and the surface soils can be said to be fully developed in that they exhibit distinct pedological horizons. Within the explored depths, the borings did not penetrate the Bear Bluff Formation soils

Materials underlying the Bear Bluff near this area are mapped as upper Cretaceous age sediments of the much older Bladen Formation (Kb). Bladen Formation soils generally consist of thin intercalated sand-clay sequences which were deposited in a predominantly marine environment. Bladen Formation soils were not encountered in the borings.

**REFERENCE ONLY**

## **6.0 Subsurface Conditions**

The generalized subsurface conditions at the site are described below. For more detailed descriptions and stratifications at test locations, the respective boring and sounding logs should be reviewed in Appendix II.

### **6.1 Interpreted Subsurface Profile**

One interpreted subsurface cross-sectional profile of the site soils is attached in Appendix I as Figure 4. The cross-section orientation in plan view is shown on Figure 2. Profile A-A' traverses the proposed building pad in a northwest to southeast direction and looking in a northeasterly direction.

The strata indicated in the profile are characterized in the following sections. Note that the profile is not to scale and was prepared for illustrative purposes only. Subsurface stratifications may be more gradual than indicated, and conditions may vary between test locations. Soils presented on the profile were grouped into several general strata based on estimated physical properties derived from the borings, soundings, and the recovered samples. The strata encountered are labeled on the soil profile to allow their properties to be systematically described.



## 6.2 Description of Subsurface Soils

This section describes subsurface soil conditions observed at the site, as illustrated on the profile in Figure 4 of Appendix I.

### 6.2.1 *Stratum I: Upper Very Loose to Loose Sands and Soft Clays*

Underlying the wood chips at test location HA-8 and underlying the topsoil at the remaining test locations very loose to loose sands and soft clays (Stratum I) were encountered to depths ranging from about 5 to 21 feet below the ground surface and to the maximum exploration depths of 4 to 5 feet in the hand auger borings. In the hand auger borings, these soils generally consist of clayey sands (USCS Classification "SC") and silty sands (SM). The moisture condition of these soils was observed to be generally moist to wet, with brown, tan, orange, and gray coloration. CPT tip resistance values at the test locations ranged from approximately 10 tons per square foot (tsf) to 50 tsf with an average tip resistance of about 10 to 40 tsf, indicating a typically very loose to loose relative density in the sands and a generally soft consistency in the clays. CPT tip resistance values increase from 100 to 210 tsf in isolated sand seams approximately 1 to 1 ½ feet in thickness in test soundings C-11 and C-12. DCP blow counts in hand auger borings HA-1 through HA-10 ranged from 2 blows per inch (bpi) to 10 bpi, indicating a generally very loose to loose relative density near the surface.

Where measured, soils within this stratum exhibited natural moisture contents ranging from 12.2 to 25.8 percent, silt and clay fines contents ranging from 20.9 to 46.5 percent by weight passing the No. 200 sieve, and Atterberg limits testing of the minus #40 sieve materials exhibited liquid limits ranging from 23 to 33 percent, plastic limits ranging from 14 to 16 percent, and a plasticity indices ranging from 8 to 19 percent, indicating generally medium plasticity. Atterberg limits testing of soils from test location C-9 indicated non-plastic behavior.

Two bulk samples were re-compacted in the laboratory using modified effort in general accordance with ASTM D 1557 procedures, resulting in maximum dry densities ranging from 125.0 to 128.5 pounds per cubic foot (pcf) at optimum moisture contents ranging from 8.7 to 9.7 percent. This indicates that the natural moisture contents of the bulk samples ranged from about 8 to 9 percent wet of optimum at the time of sampling.

This indicates that drying may need to be performed to obtain favorable conditions for compaction in these soils.

California Bearing Ratio (CBR) testing was performed upon recompacted portions of the bulk samples, with test points recompacted in the laboratory to approximately 94 to 95 percent of the modified Proctor maximum dry density in general accordance with ASTM D 1883 procedures. The soaked CBR value ranged from 14 to 20.6 percent. These results indicate that the Stratum I soils are expected to provide good subgrade support characteristics once dried to within recommended moisture levels.

### 6.2.2 *Stratum II: Lower Medium Dense to Very Dense Sands*

Underlying the Stratum I at test locations C-1 through C-6, C-8, C-9, C-13, and C-14, medium dense to very dense sands (Stratum II) were encountered to a depth of about 15 feet below the ground surface in soundings C-7 to C-10, and to the maximum exploration depths of 20 to 30 feet in the remaining soundings. This stratum was not encountered at test location C-12. CPT tip resistance values at the test locations ranged widely from



approximately 25 to 310 tsf with average tip resistances ranging from about 100 to 200 tsf, indicating a typically medium dense to dense relative density with some loose to very dense layers.

### 6.2.3 *Stratum IIA: Very Loose Sensitive Fine-Grained Soils*

Underlying Stratum II at test location C-7 and beginning at a depth of about 15 feet, we encountered very loose fine-grained soils (Stratum IIA) to the maximum exploration depth of 30 feet in sounding C-7. This stratum was not encountered at any of the other test locations. CPT tip resistance values at test location C-7 ranged from approximately 5 to 35 tsf, and averaged about 5 to 10 tsf, indicating a very soft consistency.

### 6.2.4 *Stratum IIB: Lower Intermediate Soft to Stiff Silts and Clays*

Underlying Stratum II at test location C-10 and underlying Stratum I at test locations C-11 and C-12, a stratum of soft clay soils (Stratum IIB) was encountered to the maximum exploration depth of 30 feet in soundings C-10 and C-12, and to a depth of about 21 feet in sounding C-11. In C-11 this stratum had a few interbedded sand seams that were not present in C-10 or C-12. This stratum was not encountered at the other test locations. CPT tip resistance values within this stratum was approximately 10 tsf, indicating a soft consistency.

### 6.2.5 *Groundwater*

Based on pore pressure readings measured in the cone soundings, the groundwater level at the time of our exploration was interpreted to range from 8 to 11 feet below the ground surface across the site. Groundwater levels within the hand auger borings ranged from above the ground surface to about 3 feet, with the shallowest conditions observed near the western portion of the site in the vicinity of test locations C-7 and C-8. Groundwater was not encountered in the hand auger borings at test locations HA-1, HA-2, C-9, and C-12 through C-14.

Based on the soil stratigraphy, the shallow groundwater measurements indicate that this site is susceptible to shallow perched water conditions, where water from runoff and precipitation becomes trapped on top of and within the upper sandier soils overlying less permeable clayey soils. Groundwater levels may fluctuate seasonally at the site, being influenced by rainfall variation and other factors. Site construction activities can also influence groundwater elevations.

### 6.2.6 *Summary of Laboratory Test Results*

We performed laboratory testing on four grab samples and two composite bulk samples to further assess the engineering index properties of the subsurface soils. The laboratory soil index test results are presented in Appendix III and are summarized in the following table.



**Table 6-1 – Summary of Laboratory Soil Index Testing Results**

Boring/ (Sample No.)	Sample Depth	Natural Moisture Content (%)	Silt/Clay Fines Content (%)	Atterberg Plasticity Limits			USCS Classification
				LL	PL	PI	
C-2(S-1)	0.5' – 2'	12.2	39.7	24	16	8	SC
C-6/(S-1)	8" – 1.5'	17.8	34.3	23	15	8	SC
C-9/(S-1)	8" – 1.5'	19.5	20.9	--	NP	--	SM
HA-9/(S-1)	3' – 4'	25.8	44.2	33	14	19	SC
HA-1/(BULK 1)	0.5' – 2'	17.4	46.5	26	15	11	SC
HA-7/(BULK 2)	0.5' – 2'	17.8	38.7	22	14	8	SC

**Table 6-2 - Summary of Moisture-Density and CBR Test Results**

Boring / (Sample No.)	Modified Proctor Maximum Dry Density (pcf)	Modified Proctor Optimum Moisture Content (%)	CBR at 0.1 in. Penetration (%)
HA-1/(BULK 1)	125.0	9.7	14.0
HA-7/(BULK 2)	128.5	8.7	20.6

REFERENCE ONLY

## 7.0 Seismic Site Class and Design Parameters

As of January 1, 2020, the 2018 edition of the International Building Code (IBC) has been adopted for use in South Carolina. We classified the site as one of the Site Classes listed in IBC Section 1613.3, using the procedures described in Chapter 20 of ASCE 7-16.

### 7.1 Evaluation of Seismic Site Class

Seismic-induced ground shaking at the foundation is the effect taken into account by seismic-resistant design provisions of the International Building Code (IBC). Other effects, including landslides and soil liquefaction, must also be considered.

The initial step in site class definition is to check for the four conditions described for Site Class F, which would require a site specific evaluation to determine site coefficients  $F_A$  and  $F_V$ . Soils vulnerable to potential failure include the following: 1) quick and highly sensitive clays or collapsible weakly cemented soils, 2) peats and highly organic clays, 3) very high plasticity clays, and 4) very thick soft/medium stiff clays. These soils were not evident in the borings.

One other determining characteristic, liquefaction potential under seismic conditions, was assessed. Soils were assessed qualitatively for liquefaction susceptibility based on their age, stratum, mode of deposition, degree of



cementation, and size composition. This assessment considered observed liquefaction behavior in various soils in areas of previous seismic activity.

Our analysis, which is more fully described below, indicates that significant liquefaction of subsoils appears unlikely to occur at this site in the event of the design magnitude earthquake; therefore, Site Class F conditions do not reasonably apply to this site.

### *7.1.1 Average Shear Wave Velocity*

Based on shear wave velocities measured at the site, we determined that site response factors  $F_A$  and  $F_V$  corresponding to Site Class D would be applicable to determine spectral values for design for the initial speculative building. This recommendation is provided based on the average weighted shear wave velocities measured to a depth approximately 30 feet at test location C-5 and extrapolated to a depth of 100 feet. The averaged measured shear wave velocity was 859 fps which is greater than the 600 feet per second that is required for consideration of Site Class D design parameters, but less than the 1,200 fps that is required for consideration of Site Class C design parameters. See Figure 5 in Appendix I for the shear wave velocity profile used in this analysis.

### *7.1.2 Liquefaction of Bearing Soils and Peak Ground Accelerations*

Liquefaction of saturated, loose, cohesionless soils occurs when they are subjected to earthquake loading that causes the pore pressures to increase and the effective overburden stresses to decrease, to the point where large soil deformation or even transformation from a solid to a liquid state results. Earthquake-induced ground surface acceleration at the site was assumed from the building code design peak ground acceleration of 0.24g.

### *7.1.3 Liquefaction Potential Index (LPI)*

To evaluate liquefaction potential, we performed analyses using the data obtained in the borings and soundings, considering the characteristics of the soil and water levels observed in the boring. The liquefaction analysis was performed based on the design earthquake prescribed by the 2015 edition of the International Building Code, the "simplified procedure" as presented in Youd et al. (2001), and recent research concerning the liquefaction resistance of aged sands (Hayati & Andrus, 2008; Andrus et al. 2009; Hayati & Andrus, 2009).

To help evaluate the consequences of liquefaction, we have computed the Liquefaction Potential Index (LPI), which is an empirical tool used to evaluate the potential for liquefaction to cause damage. The LPI considers the factor of safety against liquefaction, the depth to the liquefiable soils, and the thickness of the liquefiable soils to compute an index that ranges from 0 to 100. An LPI of 0 means there is no risk of liquefaction; an LPI of 100 means the entire profile is expected to liquefy. The level of risk is generally defined below.

- **LPI < 5** – surface manifestation and liquefaction-induced damage not expected.
- **5 ≤ LPI ≤ 15** – moderate liquefaction with some surface manifestation possible.
- **LPI > 15** – severe liquefaction and foundation damage is likely.

The average LPI for this site was less than 1 using the ASCE 7-16 site modified peak ground accelerations, which indicates that the risk of surface damage due to liquefaction is low, and is not expected to occur. Significant



ground settlements during an earthquake caused by the volumetric compression of the saturated sands are not expected. Therefore, Site Class F does not reasonably apply to this site.

## 7.2 Seismic Design Coefficients

The spectral accelerations and site coefficients for the initial speculative building site are given below in Table 7-1. It is important to note that these parameters **only apply** to the initial speculative building pad. We anticipate based upon the CPT sounding results at C-7, and possibly also at C-10, C-11, and/or C-12, that those portions of the site exhibit a weaker soil profile and may be Site Class E. This would need to be evaluated in the future as part of future design geotechnical explorations.

**Table 7-1: Seismic Design Coefficients for Initial Speculative Building Pad Only**

Criteria	Site Class	$S_s$	$S_1$	$S_{D5}$	$S_{D1}$	$PGA_M$	Seismic Design Category*
General Procedure 2018 IBC/ASCE 7-16	D	0.31	0.11	0.32	0.18	0.24	C

\*applies to Risk Categories I, II, and III only.

## 7.3 Seismic Design Category

For the initial speculative building having a Risk Category classification of I, II, or III, the  $S_{D5}$  and  $S_{D1}$  values obtained are consistent with "Seismic Design Category C" as defined in section 1613.3.5 of the 2018 IBC.

It is important to note that this seismic design category **only applies** to the initial speculative building pad. We anticipate based upon the CPT sounding results at C-7, and possibly also at C-10, C-11, and/or C-12, that those portions of the site exhibit a weaker soil profile and may be Seismic Design Category D. This would need to be evaluated in the future as part of future design geotechnical explorations.

## 8.0 Conclusions and Recommendations

The conclusions and recommendations included in this section are based on the project information outlined previously and the data obtained during our exploration. If the construction scope is altered, the locations of the structures changed, or if conditions are encountered during construction that differ from those encountered in the borings, then S&ME, Inc. should be retained to review the following recommendations based upon the new information and make any necessary changes.

Based upon the results of our exploration and our past experience with similar soils in the site vicinity, the site appears generally adaptable for the proposed development. Based on the assumed loading and settlement tolerances, it appears feasible that the structure can be supported on a shallow foundation system.

### 8.1 Site Preparation and Dewatering

1. Strip surface vegetation, woody debris, and rootmat and dispose of outside the building footprints. Burn piles or debris piles should not be located within building or pavement footprints.



2. Based on significant areas of ponded water on the site and the shallow groundwater depths measured during our exploration, and dependent upon weather conditions when grading takes place, groundwater will likely be a significant concern for development of this site. The near-surface soils are clayey and relatively impermeable. During periods of wet weather, a perched groundwater condition is likely to develop, similar to the site conditions documented at the time of the exploration. For these reasons, **it is critical that drainage be established early in the grading phase of the project; we recommend that the ditching be installed several months prior to beginning site grading.**
  - A. Drainage will likely need to consist of a series of gravity-drained ditches around the perimeter of the construction areas and "finger" ditches spaced at regular intervals within the construction area.
  - B. In some cases, it may be advisable that these ditches be converted to permanent underdrains by the additions of fabric wrapped washed gravel, to help provide long-term drainage for the facility.
  - C. The ditches should be excavated to such a depth that would allow a minimum separation of at least 3 feet between planned subgrade elevations and the ground water elevation. Ditches should have sufficient relief to facilitate gravity flow.
  - D. Groundwater levels should be re-evaluated by an S&ME Geotechnical Engineer just prior to beginning the grading phase of the project to allow us to better refine our dewatering recommendations. Even during hot or dry weather, the grading contractor should take measures so that periodic rain showers do not significantly affect grading. This includes diverting rainwater runoff away from the construction area and shaping the ground surface to help prevent rainwater runoff from ponding and migrating into the surface soils.
3. After drainage is established, the organic-laden topsoils within the proposed construction areas should be stripped and hauled off or placed in non-structural area of the site, due to their organic content and potential to hold moisture.
4. After the stripping operation is complete and temporary site drainage has been installed, but before mass fill placement begins, the stripped surface in areas to receive new fill should be densified by making several passes with a heavy non-vibratory roller prior to the placement of any new fill. Moisture conditioning of the subgrade may be required prior to densification, depending on site conditions. Soils may need to be plowed or disced and dried, (or in some less likely cases wetted) in order to adjust the moisture content to suitable levels for compaction.
5. Following densification, the densified subgrade surface should be proofrolled by the contractor under the observation of the Geotechnical Engineer (S&ME) by making repeated passes with a fully-loaded dump truck or earth-moving pan. The proofrolling should be conducted only during dry weather. Areas of rutting or pumping soils indicated by the proofroll may require selective undercutting or further stabilization prior to any new fill placement or slab construction, as determined by the geotechnical engineer.

## 8.2 Fill Placement and Compaction

Where new fill soils are to be placed on this project site, the following recommendations apply:

1. Fill should be comprised of soils free of excessive organic matter or other deleterious materials. Before beginning to place fill, each proposed fill material should be sampled and tested to measure its maximum



dry density, optimum moisture content, natural moisture content, and suitability for use as a structural fill material. Elastic silts (MH), and organic soils (OL/OH) should not be used as structural fill material.

2. The upper clayey sands (Stratum I) soils to depths of about 7 to 13 feet do not appear to meet the materials requirements recommended below in item No. 3 for imported fills; however, that does not preclude their use as structural fill if properly dried.
  - A. If the upper clayey sand soils are to be used as structural fill, they will likely require significant drying (we estimate based on our laboratory test results that in their present condition these soils are about 8 to 9 percent above optimum moisture content) and workability will likely be limited if these soils are wet during grading.
  - B. To achieve compaction it will be necessary during placement of these soils that the moisture content be maintained between +2 /-3 percent of optimum moisture content, as established by the modified Proctor. In order to accelerate drying, the on-site borrow soils may be chemically amended prior to compacting the lift. If the grading is performed during wet times of the year, this may be the only feasible way to use on-site clayey borrow soils as fill and get the earthwork completed within a reasonable amount of time.
3. Imported fill soils to be used as structural fill should meet the following minimum requirements: plasticity index of 10 percent or less; clay/silt fines content of not greater than 20 percent. This may include soils from the following ASTM soil classifications: SW, SP, SW-SM, SP-SM, SW-SC, SP-SC, SM, and/or SC. Not all soils in these categories will comply with the plasticity and fines content requirements; therefore, the contractor should sample each fill material that they propose to use and submit it to the Geotechnical Engineer for determination of its suitability, and measurement of the maximum dry density, optimum moisture content, and natural moisture content.
4. Structural fill under buildings and pavements should be compacted to at least 95 percent of the maximum dry density as defined by the modified Proctor (ASTM D1557).
  - A. Compacted soils should not exhibit pumping or rutting under equipment traffic.
  - B. Loose lifts of fill should be no more than 10 inches in thickness prior to compaction.
  - C. Structural fill should extend at least 5 feet from the edge of pavements and the edge of buildings before being allowed to exhibit a lesser degree of compaction.
  - D. In *non-structural fill areas only*, such as in landscaped areas that are located at least 5 feet outside the footprint of pavements and buildings, fill should be compacted to at least 90 percent of the maximum dry density by the modified Proctor criterion.
  - E. The moisture content of the fill materials should be controlled to within 3 percent below to 2 percent above the optimum moisture content. 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 under traffic.
5. Fill placement should be observed by an experienced S&ME soils testing technician working under the guidance of the Geotechnical Engineer.
  - A. At least one field density test should be performed per each 10,000 square feet for each lift of soil in large area fills, with a minimum of 2 tests per lift.



- B. At least one field density test should be conducted per each 150 cubic feet of fill placed in confined areas such as isolated undercuts and in trenches or behind walls, with a minimum of 1 test per lift.
  - C. At least one field density test should be conducted for each 250 linear feet of road alignment backfill, with a minimum of 1 test per lift per section.
6. Pipes and conduits should bear on a bedding of well-compacted crusher run stone, bearing on stable, native soils similar to those encountered in our borings. Pipe trench backfill should consist of select fill material with less than 20 percent of the particle size passing the No. 200 sieve size; such material will likely need to be imported from offsite. Trench backfill should be compacted to at least 95 percent of the soil's modified Proctor maximum dry density, as previously referenced (ASTM D 1557).

### 8.3 Shallow Foundations

Assuming that the recommendations presented herein are followed, the proposed initial speculative building may be supported with shallow foundation systems.

- ◆ Please note that the following recommendations may not be applied to any other structures in the industrial park without further geotechnical exploration of the future pads. Soil conditions throughout the industrial park vary significantly, and soil support conditions may be less favorable in the northern and western portions of the park, for example, in the vicinity of test locations C-7, C-10, C-11, and C-12.

The following recommendations are provided for the design and construction of shallow foundations for the proposed initial speculative building structure.

1. A net available bearing pressure of up to 2,500 psf may be used for design of individual spread footings and wall footings that are extended to bear within firm native soils or upon structural fill compacted as recommended in Section 8.2 of this report.
2. Lateral capacity of foundations includes a soil lateral pressure and coefficient of friction as described in IBC Section 1806. Foundations will be embedded in material similar to those described as Class 4 in Table 1806.2. Where footings are cast neat against the sides of excavations in natural soils, an allowable bearing pressure of 150 psf per foot depth below natural grade may be used in computations. An allowable coefficient of friction of 0.36, multiplied by the dead load, may be used for computation of sliding resistance. An increase of one-third in the allowable lateral capacity may be considered for load combinations, including wind and earthquake, as permitted by IBC Section 1605.3.2, unless otherwise restricted by design code provisions.
3. Have the Geotechnical Engineer's (S&ME) representative observe and test each cleaned footing excavation prior to concrete placement to observe that the required degree of soil compaction and bearing capacity is present at the foundation bearing surface. This will be evaluated by a combination of Dynamic Cone Penetrometer (DCP) testing, and probing with a small-diameter probe rod.
4. Due to the loose condition of the upper Stratum I soils, overexcavation of the immediate foundation support soils in some of the footing excavations should be expected to become necessary during the construction process to achieve satisfactory bearing capacity. For footings which bear in native soils, undercut depths may be on the order of 2 to 3 feet below design bearing grade, but may vary from footing to footing and will depend partly upon the relative elevation between the design bearing grade of



the footings and the loose/soft native soil layer. The need for overexcavation in the footing excavations should be a field decision made by the Geotechnical Engineer at the time of construction, using DCP test data, in conjunction with shallow hand auger borings, to evaluate the consistency of the soils.

- A. In the event that overexcavation of footings is required, S&ME should be present at the site to observe conditions, confirm that poor soils have been removed, and observe that the overexcavated footings are properly backfilled.
  - B. Where overexcavation is performed, foundation bearing grades should be re-established using washed, crushed, coarse gravel (such as SCDOT No. 57 or No. 67 stone) placed in densified 12-inch thick lifts. Each stabilized footing excavation should be observed and tested for suitability to support the design bearing pressure.
5. It should be anticipated that where footings bear directly on fill, the previously placed fill soils exposed in the bottom of the footings may need to be tamped to increase their density prior to the placement of foundation concrete.
  6. Even if smaller dimensions are theoretically allowable from a bearing pressure consideration, the minimum column footing width should be 30 inches and the minimum wall footing width should be 18 inches, to avoid punching shear.
  7. Footing concrete should be placed the same day that footings are excavated, to reduce the potential for exposed bearing soils to be softened due to factors such as weathering or water infiltration.
  8. The following discussion is provided regarding the estimated magnitude of settlements under static loading.

**Note:** Structural loading information was not provided to us prior to issuing this report; therefore, our analysis is based on assumed structural loading based on our past experience with similar construction. If structural loading exceeds our assumed loading or if finished floor elevation is greater than 2 to 3 feet above the existing grade elevation, then settlements greater than the estimated magnitudes below may result.

- A. Based on an assumed maximum column load of 150 kips, a uniformly applied area load (fill + slab loading + slab self-weight) of 300 psf, and a 2,500 psf shallow foundation bearing pressure, the estimated total static settlement of an individual spread footing measuring 8 feet by 8 feet in plan area will likely be on the order of 1 inch or less.
- B. Based on an assumed wall load of 6 kips per linear foot, a uniformly applied area load (fill + slab loading + slab self-weight) of 300 psf, and a 2,500 psf shallow foundation bearing pressure, the estimated static post-construction settlement of an individual wall strip footing measuring 2.5 feet in width will likely be on the order of 1 inch or less.
- C. Differential settlements between adjacent, similarly loaded walls and columns are typically on the order of 50 percent of the total post-construction settlement value under static loading, or in this case, ½ inch, or less.



## 8.4 Grade Slab Support and Construction

The following recommendations are given for the support and construction of soil-supported grade slabs for the initial speculative building:

1. Soils similar to those penetrated by the borings and soundings should provide adequate support to proposed soil-supported thin grade slabs, assuming preparation and compaction of the subgrade as recommended herein.
  - A. A modulus of subgrade reaction ( $k$ ) of 175 lbs/in<sup>3</sup> (pci) may be used to represent the properly compacted native soils for reinforcing design.
  - B. If imported fill soils are used to support the subgrade, we recommend a design modulus of 175 pci be assumed unless the fill source is first tested in the laboratory and shown to be capable of providing a greater modulus.
2. Structural design may incorporate installation of a vapor barrier prior to placing concrete for grade slab systems, to limit moisture-infiltration into finished spaces, where appropriate.
3. Below the floor slab, place a layer of at least 6 inches of compacted granular materials to provide a capillary break between the clayey sand subgrade and the floor slab in finished spaces. Please consult your slab design engineer regarding whether there is a preferred support material to help control slab shrinkage. The following recommendations are from a geotechnical viewpoint:
  - A. Underslab granular materials used may consist of clean sandy soils meeting USCS Classification SP or SW and having a silt-clay fines content of 5 percent or less by weight, or, granular materials may consist of a crushed, well-graded gravel blend such as SCDOT Graded Aggregate Base Course (GABC), or an open-graded, manufactured washed gravel such as SCDOT No. 57 or No. 67 stone.
  - B. If sand or washed gravel is used as the underslab layer, then the contractor should plan on using a pump truck to place all floor slab concrete since these materials are cohesionless and are difficult to drive vehicles on without causing rutting.
  - C. If GABC is used, then either a pump truck or direct discharge from concrete batch trucks may be appropriate depending upon the circumstances.
  - D. If sand or GABC is used, this underslab layer should be compacted to at least 98 percent of the modified Proctor maximum dry density (ASTM D 1557).
  - E. Many contractors prefer a GABC base layer under the floor (versus sand or coarse gravel) because it can accept direct traffic, and can make construction significantly easier. This is the preferred slab support alternative from a geotechnical viewpoint.
4. If construction traffic is operating on the prepared slab subgrade for some time prior to slab construction, there is a potential for deterioration of the surface. Have the Geotechnical Engineer observe all slab subgrades prior to concrete placement, including proofrolling performed by the contractor using fully-loaded tandem-axle dump trucks making repeated parallel passes. Softened or weakened soils may need to be undercut or stabilized before concrete placement.



### 8.5 Lateral Earth Pressures for Shallow Buried Structures

The equivalent fluid pressures given below should be used to design near surface soil retaining structures in the upper 5 feet of the native soil profile or within fill zones, such as loading dock walls. Under static conditions, the equivalent at-rest fluid pressure should be used to design soil-retaining structures which are fixed at the top against rotation.

Walls which will not be fixed at the top prior to application of the lateral pressures should also be designed to withstand the active earth pressures as a cantilevered wall. The values given in the following table assumes placement and compaction of backfill around these structures in accordance with the compaction recommendations given in Section 8.2 of this report.

These values assume level backfill generally classified as sandy soils (SP, SW, SP-SM) or gravel (GP, GW) according to the Unified Soil Classification system. These assumptions were made based upon the use of imported sands or clean gravels as the backfill material behind any earth-retaining walls.

**Table 8-1: Equivalent Fluid Lateral Earth Pressures**

Support Condition	Angle of Internal Friction ( $\phi'$ ) (degrees)	Soil Moist Unit Weight ( $\gamma$ ) (lbs./cu.ft.)	DRAINED CONDITION	
			Equivalent Fluid Pressure (Static Loading) (lbs./cu.ft.)	Equivalent Fluid Pressure (Seismic) PGA = 0.24g (lbs./cu.ft.)
Active ( $K_a$ )	30	120	0.33	0.40
At-Rest ( $K_o$ )	30	120	0.50	0.60
Passive ( $K_p$ )	30	120	3.00	2.81

1. The values in this table represent a fully-drained soil condition at or near the optimum moisture content. Where backfill soils are not fully drained, the design of the wall must consider lateral soil pressures due to hydrostatic forces below the water level, and the submerged soil unit weight.
2. A coefficient of sliding friction ( $\tan \Phi$ ) of 0.36 may be used in computation of the lateral sliding resistance.

We have not been provided details regarding the location or height of site retaining walls. Note that any wall which is backfilled prior to being braced internally by framing must, in addition to being designed as a fully braced wall using the at-rest earth pressure, also be designed to resist the lateral earth pressure for the active case as a fully cantilevered wall.

Note that inorganic plastic clay (CL or CH) soils such as are present within Stratum IIA and Stratum IIB should not be used as backfill immediately behind retaining walls, because these soils are not freely draining.

Footings located near proposed retaining walls may impose surcharge loads in addition to the earth pressures tabulated above. Alternatively, you may elect to extend footings to bear entirely below a line that is projected



upward at a 45-degree angle from the inner toe of the wall to avoid placing surcharge pressures on the wall due to footing loads.

Compact the backfill directly behind walls with light, hand-held compactors. Heavy compactors and grading equipment should not be allowed to operate within 5 feet of the walls during backfilling to avoid developing excessive temporary or long-term lateral soil pressures. The soil backfill placed behind retaining walls must be compacted to at least 95 percent of the soil's modified Proctor maximum dry density. We caution that operating compaction equipment directly behind the retaining structures can create lateral earth pressures far in excess of those recommended for design. Therefore, bracing of the walls may be needed during backfilling operations.

Provide positive gravity drainage of the backfill using a permanent toe drain to limit buildup of hydrostatic pressures in the backfill. Gravity drainage may consist of a minimum two-foot-wide blanket of clean crushed stone or washed sand, separated from the backfill by a properly graded filter or approved filter fabric, or a specially designed geotextile material such as Enka-drain, or equivalent. Vertical drains should be tied into a permanent "toe" drain installed at the base of the wall. Where gravity drainage of retaining walls is not feasible, design walls to resist hydrostatic forces in addition to lateral earth pressure.

## 8.6 Pavement Section Design and Construction

We understand that site pavements will consist of flexible pavements using Hot-Mixed Asphalt (HMA) and/or rigid pavements consisting of Portland cement concrete (PCC).

Based upon the requirement that the in-situ materials will be densified and new fill will be compacted to at least 95 percent of the standard Proctor maximum dry density (ASTM D 1557) and assuming that the pavement support soils consist primarily of the native Stratum I soils, we estimate that an average CBR value of at least 10 percent would be available. This results in a soil resilient modulus of about 11,153 psi for flexible pavement design, and a modulus of subgrade reaction (k) value of about 175 psi/inch for rigid PCC pavement design.

- ◆ Any proposed imported backfill materials should be tested prior to use to measure that the soil parameters assumed for design are available. If materials having lesser subgrade support values are used, then the required pavement thicknesses may need to be increased (thickened) as a result.

Flexible pavement design assumes an initial serviceability of 4.2 and a terminal serviceability index of 2.0, and a reliability factor of 95 percent. ESALs per axle were estimated using data provided in AASHTO literature. Assuming that only SCDOT approved source materials will be used in flexible pavement section construction, we used a structural layer coefficient of 0.44 for the HMA layers and a coefficient of 0.18 for the graded aggregate base course (GABC). A sub-base drainage factor of 0.9 was assigned.

Rigid pavement design assumes an initial serviceability of 4.5 and a terminal serviceability index of 2.5, and a reliability factor of 90 percent. Assuming that the concrete would be reinforced at the joints with dowel baskets to improve load transfer efficiency, we used an average load transfer coefficient of 3.2. We also assumed a minimum 28-day design compressive strength of at least 4,000 psi for the PCC, and a drainage coefficient of 1.0.

Traffic frequency and loading data was not provided prior to performing our analysis; however, our experience with similar projects, we estimate that site pavements may experience traffic consisting of the following vehicles,



loading, and frequencies. The following traffic regime results in an estimated ESAL demand of about 1,685,000 ESALs for the heavy-duty section, and about 58,000 ESALs for the light duty section.

- Automobiles – 150 two-way trips per day, 365 days per year, for 20 years – average vehicle factor of 0.004, 18-kip Equivalent Single Axle Load (ESAL) per pass.
- Light Delivery Trucks – 10 two-way trips per day, 260 days per year, for 20 years – average vehicle factor of 0.5, 18-kip equivalent Single Axle Load (ESAL) per pass.
- Garbage Truck – 2 two-way trips per week, 52 weeks per year, for 20 years – average vehicle factor of 4.0, 18-kip ESALs per pass.
- Tractor Trailer - 50 two-way trips per day, 260 days per year, for 20 years – average vehicle factor of 3.0, 18-kip equivalent Single Axle Load (ESAL) per pass.

Based on the estimated traffic demand, we estimate that pavement sections shown in Table 8-2 below should be sufficient to carry the anticipated traffic loading with reasonable factors of safety.

**Table 8-2 – Recommended Pavement Section Alternatives**

Pavement Type	Theoretical Available Traffic Capacity (ESALs)	HMA Surface Course Type C (inches)	HMA Surface Course Type B (inches)	HMA Intermediate Course Type B (inches)	4,000 psi PCC Pavement Section <sup>(b)</sup> (inches)	Compacted SCDOT Graded Aggregate Base Course [GABC] (inches)
HMA Flexible Asphalt Light-duty (no truck traffic)	102,000	2.0	---	---	---	8.0
HMA Flexible Asphalt Heavy-duty (with truck traffic)	1,730,000	---	2.0	2.0	---	10.0
PCC Rigid Heavy-duty (w/truck traffic)	1,850,450	---	---	---	8.0 <sup>(b)</sup>	6.0

- (a) Single-stage construction and soil compaction as recommended is assumed; S&ME, Inc. must observe pavement subgrade preparations and pavement installation operations.
- (b) Reinforced at the joints with dowel baskets.

### 8.6.1 *Permanent Drainage for Pavements*

Control of subsurface water will be very important to continued satisfactory performance of pavements. Where possible, road alignments should be crowned and ditched to promote positive drainage from the road surface and subgrade. Where crowning and ditching is not feasible, site drainage plans should result in water levels being maintained at least 2 feet below the pavement surface.



1. In order to provide permanent stabilization for pavements, underdrain systems are recommended to be designed for the pavement area subgrades (parking lots and roadways), due to the presence of shallow fine-grained soils that promotes the development of perched water conditions.
2. The site civil engineer should be consulted regarding the type and location of the underdrains. Our experience is that two types of underdrain systems are commonly used in this locality, depending upon the traffic application and the preferences of the civil engineer. One commonly used system is a gravel-filled, fabric-wrapped trench containing an embedded perforated plastic HDPE pipe. Another type of system that we see used is an edge drain product such as AdvanEdge by ADS, Inc. This is a fabric-wrapped, perforated HDPE slot style drain. Some engineers have used a combination of these two systems. Typically, the underdrains are tied into the storm water system to maintain positive gravity flow.
3. Do not fill any landscaped medians or islands with clayey or silty (impermeable) spoils that may impede the movement of water into the underdrains.
4. Alternatively, or in addition to the underdrains, ditches may be installed alongside the road alignment in order to provide sufficient drainage of the roadbed. Where there are no underdrains, ditches should be incorporated into design.
5. It is not expected that the dock aprons for this facility will be depressed below the surrounding grade elevation. However, in the event that depressed loading dock aprons are included in the final design, it is recommended to install a drainage blanket of open-graded gravel such as SCDOT No. 57 or No. 67 stone below the depressed slabs, directing flow toward filter-fabric wrapped underdrains that may be located around the perimeter of the aprons and which should discharge toward lower elevations or into storm water management systems. This is recommended in order to provide long-term positive subsurface drainage for PCC pavements, because of the potential for perched water to build up within the soils of Stratum I during wet times of the year.

REFERENCE ONLY

### 8.6.2 *Base Course and Pavement Section Construction*

The following recommendations are provided for base course and pavement section construction:

1. Prior to placement of base course stone, all exposed pavement subgrades should be methodically proofrolled under the observation of the Geotechnical Engineer (S&ME), and any identified unstable areas should be repaired. Pavement subgrades should not exhibit rutting or pumping under the proofroll load. Rutting or pumping areas shall be undercut and replaced and/or stabilized as directed by the engineer. Stabilization of particularly unstable areas may necessitate the use of either a geosynthetic grid, such as Tensar BX-1200, or a heavy woven geotextile such as Mirafi HP-370 or HP-570. The use of lime stabilization to amend the subgrade soils may reduce the risk of needing geosynthetics to assist with improving soil strength.
2. Crushed stone aggregate base material used in pavement section construction should consist of "Macadam" type graded aggregate base course (GABC) as defined by Section 305 of the South Carolina Department of Transportation Standard Specifications for Highway Construction (2007 edition).
  - A. We do not recommend the use of Recycled Portland Cement Concrete type base course for this facility, due to its greater moisture sensitivity.
  - B. The base course in all pavement areas should be compacted to 100 percent of the modified Proctor maximum dry density (ASTM D 1557/SC-T-140).



- C. The base course material should not exhibit pumping or rutting under equipment traffic.
3. 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 near optimum moisture content in order to facilitate proper compaction.
4. Construct the surface course HMA in accordance with the specifications of Sections 401 and 403 of the South Carolina Department of Transportation Standard Specifications for Highway Construction (2007 edition).
5. Construct the intermediate course HMA in accordance with the specifications of Sections 401 and 402 of the South Carolina Department of Transportation Standard Specifications for Highway Construction (2007 edition).
6. 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.
7. Experience indicates that a thin surface overlay of asphalt pavement may be required in about 7 to 10 years due to normal wear and weathering of the surface. Such wear is typically visible in several forms of pavement distress, such as aggregate exposure and polishing, aggregate stripping, asphalt bleeding, and various types of cracking. There are means to methodically estimate the remaining pavement life based on a systematic statistical evaluation of pavement distress density and mode of failure. We recommend the pavement be evaluated in about 7 years to assess the pavement condition and remaining life.
8. For rigid pavements, we recommend air-entrained ASTM C 94 jointed Portland cement concrete that achieves a minimum compressive strength of at least 4,000 psi at 28 days after placement, as measured by ASTM C 39. We also recommend that the pavement concrete be constructed in a manner which at least meets the minimum standards recommended by the American Concrete Institute (ACI).
9. We recommend that at least 1 set of 5 cylinder test specimens be cast by S&ME per every 100 cubic yards of pavement concrete placed, or at least once per placement event, in order to measure achievement of the design compressive strength. We also recommend that a certified S&ME concrete technician be present on site to observe the concrete placement activities.

## 9.0 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 in this report are based on the applicable standards of our practice in this geographic area at the time this report was prepared. No other warranty, expressed or implied, is made.

The analyses and recommendations submitted herein are based, in part, upon the data obtained from the subsurface exploration. The nature and extent of variations across the site may not become evident until construction. If variations appear evident, then we should be given a reasonable opportunity to re-evaluate the recommendations of this report. In the event that any changes in the nature, design, or location of the structures are planned, the conclusions and recommendations contained in this report shall not be considered valid unless the changes are reviewed and conclusions modified or verified in writing by the submitting engineers.



Assessment of site environmental conditions; sampling of soils, ground water or other materials for environmental contaminants; identification of jurisdictional wetlands, rare or endangered species, geological hazards or potential air quality and noise impacts were beyond the scope of this geotechnical exploration.

Information regarding auxiliary construction items including but not limited to retaining walls, trash dumpster storage pads, curbing, street lights, signage, utilities, fountains, flagpoles, machine pits, etc. was not provided by the client and therefore has not been addressed as part of the scope of this report. If additional foundation design or construction recommendations are needed with regard to any such items, please contact us.

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 upon S&ME's review of final plans and specifications followed by our observation and monitoring of earthwork and foundation construction and pavement construction activities. 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.

**REFERENCE ONLY**

## **Appendices**

**REFERENCE ONLY**

**Appendix I – Figures**

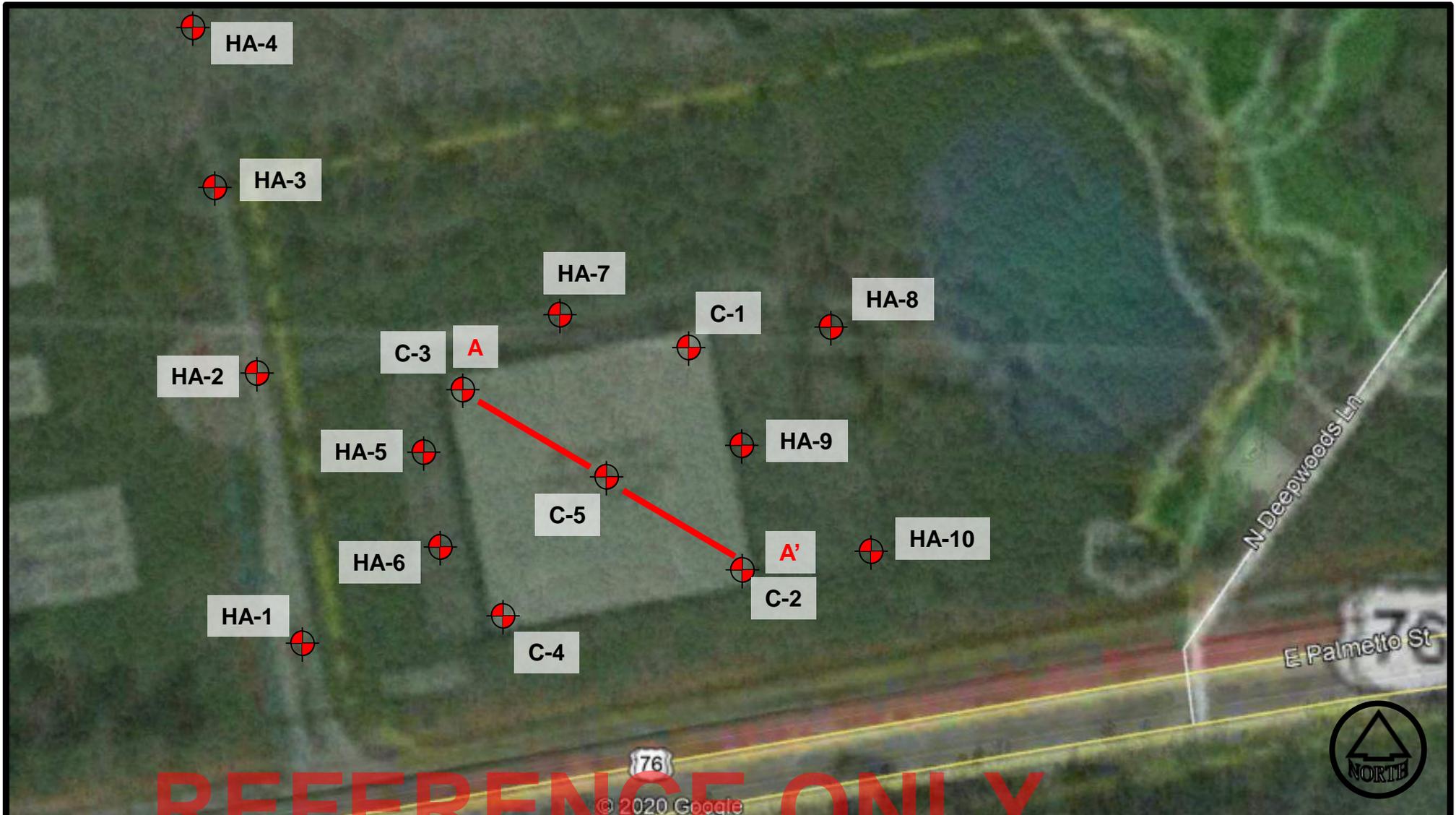
**REFERENCE ONLY**



REFERENCE:  
Image Courtesy of Google Earth



	<h2>Site Vicinity Map</h2>	SCALE: Not to Scale	FIGURE NO.  <h1>1</h1>
	Florence Industrial Park Florence, South Carolina	DATE: 10-28-20	
		PROJECT NUMBER 1339-20-035	



**LEGEND**

= Approximate Test Location     
 = Interpreted Subsurface Profile

**REFERENCE:**

Aerial Image Courtesy of Google Earth

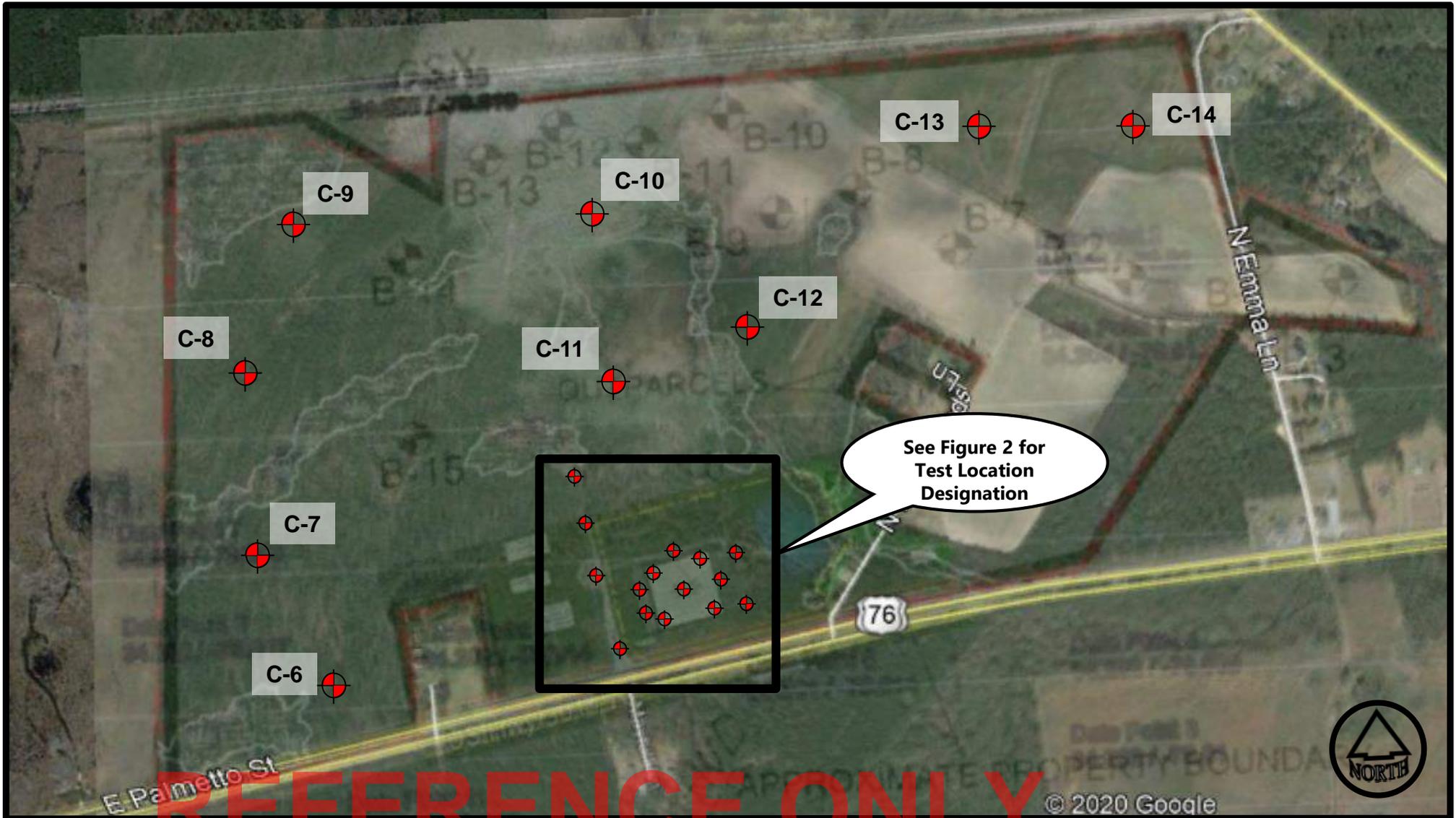
REFERENCE ONLY



**APPROXIMATE TEST LOCATION SKETCH A**

Florence Industrial Park  
Florence, South Carolina

SCALE:	FIGURE NO.
NOT TO SCALE	<b>2</b>
DATE:	
PROJECT NUMBER:	
1339-20-035	



**LEGEND**

= Approximate Test Location

**REFERENCE:**

Image Courtesy of Google Earth

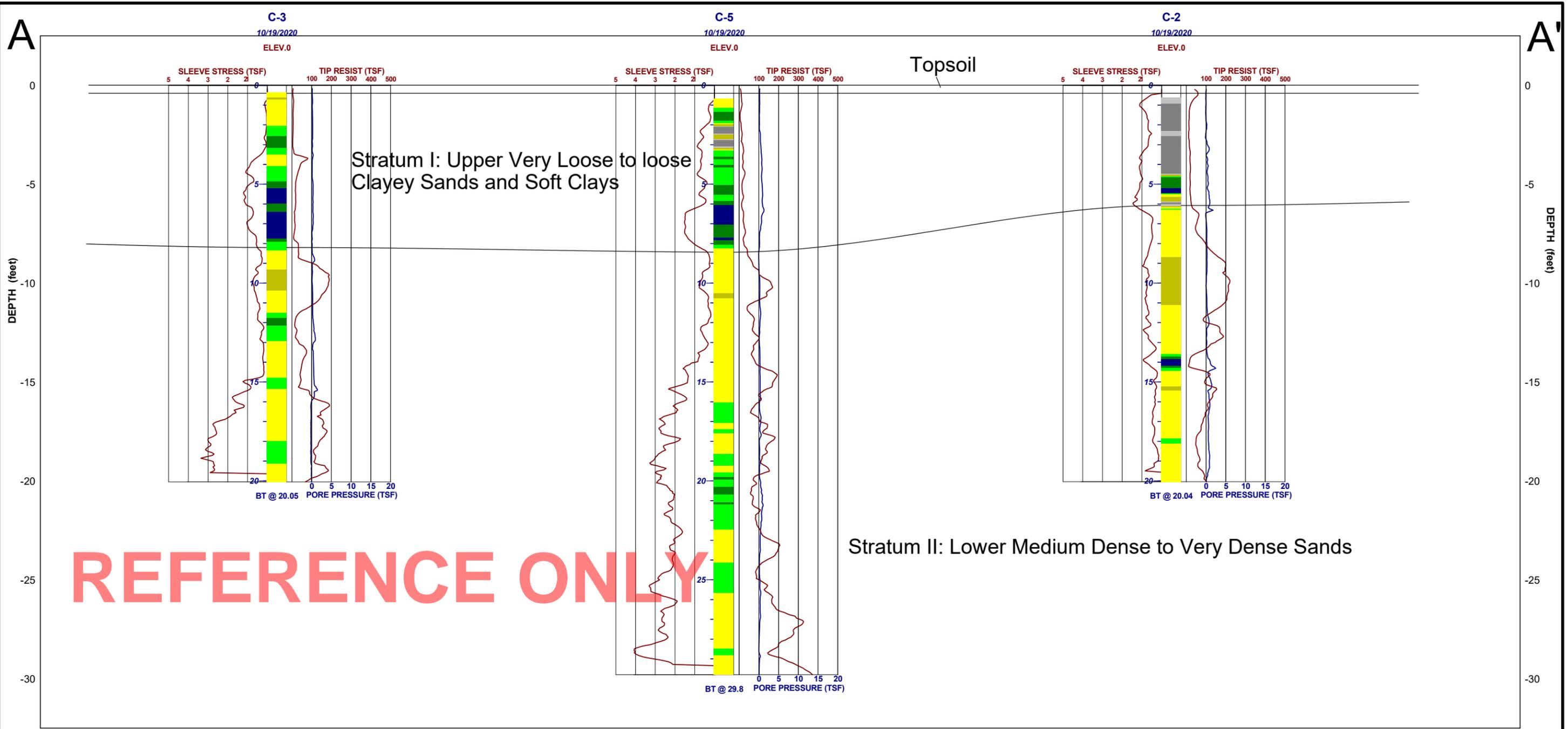
REFERENCE ONLY

**APPROXIMATE TEST LOCATION SKETCH B**

Florence Industrial Park  
Florence, South Carolina

SCALE:	FIGURE NO.
NOT TO SCALE	<b>3</b>
DATE:	
PROJECT NUMBER:	
10/28/2020	
1339-20-037	





REFERENCE ONLY

**CPT/DMT MATERIAL GRAPHICS**

- Sensitive Fine Grained Soils
- Organic Soils, Peats
- Clay to Silty Clay
- Clayey Silt to Silty Clay
- Silty Sand to Sandy Silt
- Clean Sand to Silty Sand
- Gravelly Sand to Sand
- OC Sand to Clayey Sand
- OC Fine Grained Soils

**ELECTRONIC CONE PENETROMETER SOUNDINGS**

C-3 Sounding Number 123.0 Elevation at GS

DMT-3 Sounding Number 123.0 Elevation at GS

SOIL TEST BORINGS

B-3 Boring Number 123.0 Elevation at GS

**LEGEND OF MATERIAL GRAPHICS for SOIL TEST BORINGS**

- 11-16-10 Standard Penetration Test (blows per foot).
- 12in Undisturbed Sample Recovery in Inches
- NX REC 80% Core Barrel Size Recovery in Percent
- RQD 56% Rock Quality Designation

The depicted stratigraphy is shown for illustrative purposes only and is not warranted. Separations between different strata may be gradual and likely vary considerably from those shown. Profiles between nearby borings have been estimated using reasonable engineering care and judgment. The actual subsurface conditions will vary between boring locations.

**SUBSURFACE PROFILE**

Diagram: Figure 4

PROJECT: Florence Industrial Park

LOCATION: Florence, South Carolina

JOB NO: 1339-20-035

DATE: 11/11/20



# Shear Wave Velocity Calculations

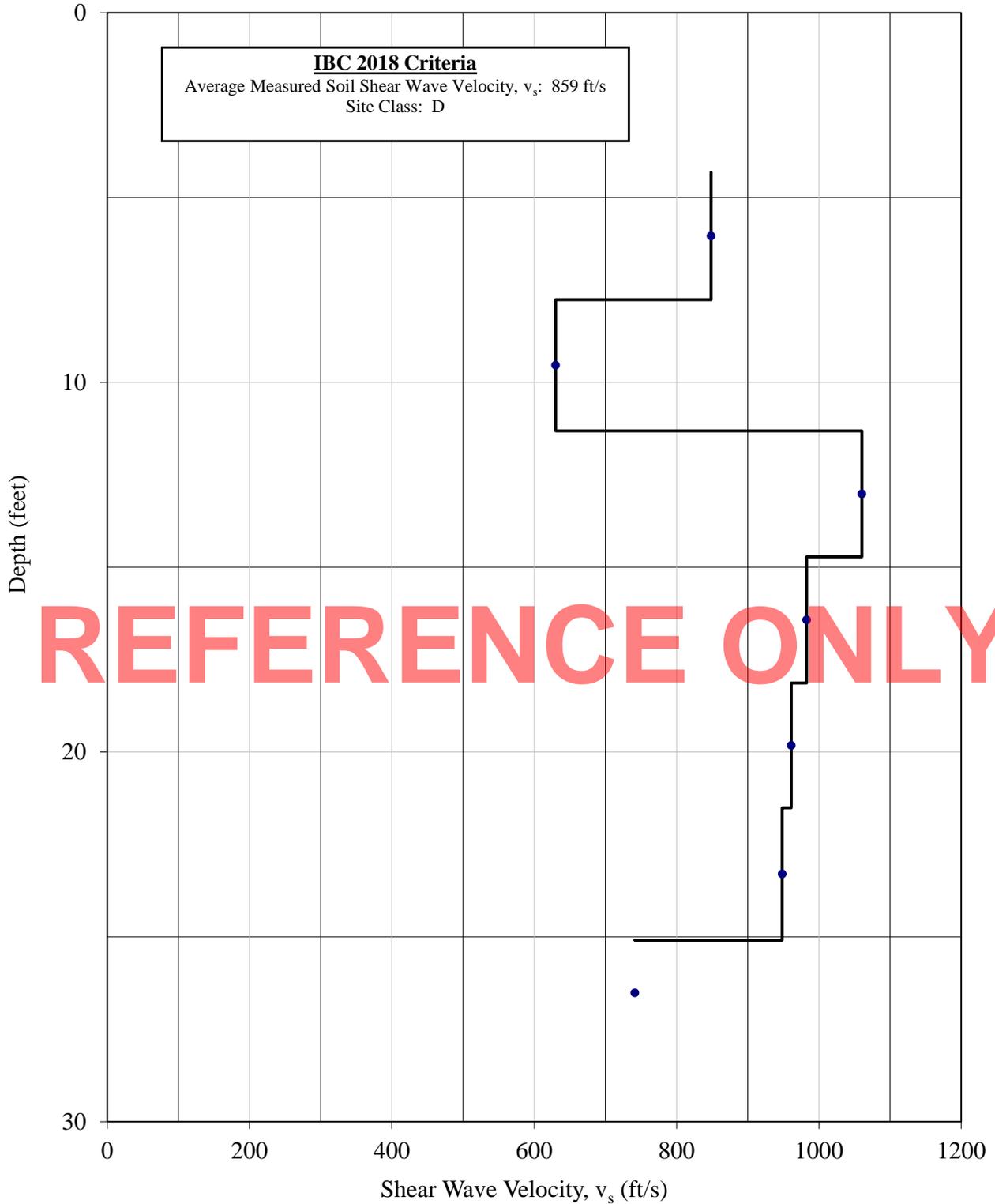
Figure 5

Florence Industrial Park

Florence, SC

Sounding ID: **C-5**  
Date: 10/19/20

Project Number: **1339-20-035**



\* Site Class based on 2018 International Building Code - Table 1613.5.2 - SITE CLASS DEFINITIONS

**Appendix II – Exploration Data**

**REFERENCE ONLY**

## ❖ Summary of Exploration Procedures

The American Society for Testing and Materials (ASTM) publishes standard methods to explore soil, rock and ground water conditions in Practice D-420-18, "*Standard Guide for Site Characterization for Engineering Design and Construction Purposes.*" The boring and sampling plan must consider the geologic or topographic setting. It must consider the proposed construction. It must also allow for the background, training, and experience of the geotechnical engineer. While the scope and extent of the exploration may vary with the objectives of the client, each exploration includes the following key tasks:

- ◆ Reconnaissance of the Project Area
- ◆ Preparation of Exploration Plan
- ◆ Layout and Access to Field Sampling Locations
- ◆ Field Sampling and Testing of Earth Materials
- ◆ Laboratory Evaluation of Recovered Field Samples
- ◆ Evaluation of Subsurface Conditions

The standard methods do not apply to all conditions or to every site. Nor do they replace education and experience, which together make up engineering judgment. Finally, ASTM D 420 does not apply to environmental investigations.

## ❖ Reconnaissance of the Project Area

We walked over the site to note land use, topography, ground cover, and surface drainage. We observed general access to proposed sampling points and noted any existing structures.

Checks for Hazardous Conditions - State law requires that we notify South Carolina 811 (SC811) before we drill or excavate at any site. SC811 is operated by the major water, sewer, electrical, telephone, CATV, and natural gas suppliers of South Carolina. SC811 forwarded our location request to the participating utilities. Location crews then marked buried lines with colored flags within 72 hours. They did not mark utility lines beyond junction boxes or meters. We checked proposed sampling points for conflicts with marked utilities, overhead power lines, tree limbs, or man-made structures during the site walkover.

## ❖ Boring and Sampling

### Electronic Cone Penetrometer (CPT) Soundings

CPT soundings consist of a conical pointed penetrometer which is hydraulically pushed into the soil at a slow, measured rate. Procedures for measurement of the tip resistance and side friction resistance to push generally follow those described by ASTM D-5778, "*Standard Test Method for Performing Electronic Friction Cone and Piezocone Penetration Testing of Soils.*"

## ***Summary of Exploration Procedures - Continued***

A penetrometer with a conical tip having a 60 degree apex angle and a cone base area of 10 cm<sup>2</sup> was advanced into the soil at a constant rate of 20 mm/s. The force on the conical point required to penetrate the soil was measured electronically every 50 mm penetration to obtain the *cone resistance*  $q_c$ . A friction sleeve is present on the penetrometer immediately behind the cone tip. The force exerted on the sleeve was measured electronically at a minimum of every 50 mm penetration and divided by the surface area of the sleeve to obtain the *friction sleeve resistance value*  $f_s$ . A pore pressure element mounted immediately behind the cone tip was used to measure the pore pressure induced during advancement of the cone into the soil.

### **Shear Wave Velocity Tests**

Shear wave velocity measurements were performed using a cone penetrometer equipped with geophones, or a seismic cone penetrometer (SCPT). The seismic cone penetrometer measures the travel times of surface generated vibrations to geophones mounted on the penetrometer at various incremental depths in the sounding. At a given depth, the travel time of the first arrival is measured and corrected for the horizontal offset of the source at the surface from the sounding. Interval velocities are calculated by dividing the difference in travel times by the vertical distance between successive measurement depths. Measurements were made at 1 meter intervals – the length of commonly available CPT extension rods – unless otherwise noted.

### **CPT Soil Stratification**

Using ASTM D-5778 soil samples are not obtained. Soil classification was made on the basis of comparison of the tip resistance, sleeve resistance and pore pressure values to values measured at other locations in known soil types, using experience with similar soils and exercising engineering judgment.

Plots of normalized tip resistance versus friction ratio and normalized tip resistance versus penetration pore pressure were used to determine soil classification (Soil Behavior Type, SBT) as a function of depth using empirical charts developed by P.K. Robertson (1990). The friction ratio soil classification is determined from the chart in the appendix using the normalized corrected tip stress and the normalized corrected tip stress and the normalized friction ratio.

At some depths, the CPT data fell outside of the range of the classification chart. When this occurred, no data was plotted and a break was shown in the classification profile. This occasionally occurred at the top of a penetration as the effective vertical stress is very small and commonly produced normalized tip resistances greater than 1000.

To provide a simplified soil stratigraphy for general interpretation and for comparison to standard boring logs, a statistical layering and classification system was applied the field classification values. Layer thicknesses were determined based on the variability of the soil classification profile, based upon changes in the standard deviation of the SBT classification number with depth. The average SBT number was determined for each successive 6-inch layer, beginning at the surface. Whenever an additional 6-inch increment deviated from the previous increment, a new layer was started, otherwise, this material was added to the layer above and the next 6-inch section evaluated. The soil behavior type for the layer was determined by the mean value for the complete layer.

## ***Summary of Exploration Procedures - Continued***

### **Refusal to CPT Push**

Refusal to the cone penetrometer equipment occurred when the reaction weight of the CPT rig was exceeded by the thrust required to push the conical tip further into the ground. At that point the rig tended to lift off the ground. At this site, refusal may have resulted from encountering hard cemented or indurated soils.

### **Hand Auger Borings**

Auger borings were advanced using hand-operated augers. The soils encountered were identified in the field by cuttings brought to the surface. Representative samples of the cuttings were placed in plastic bags and transported to the laboratory. Soil consistency was qualitatively estimated by the relative difficulty of advancing the augers.

### **Standard Dynamic Cone Penetrometer (DCP)**

At selected intervals, the augers were withdrawn and soil consistency measured with a dynamic cone penetrometer. The conical point of the penetrometer was first seated 1-3/4 inches to penetrate any loose cuttings in the boring, then driven two additional 1-3/4 inch increments by a 15 pound hammer falling 20 inches. The number of hammer blows required to achieve this penetration was recorded. When properly evaluated by qualified professional staff, the blow count is an index to the soil strength and ability to support foundations.

### **Water Level Determination**

Groundwater levels in the soundings were not directly measured but were instead interpreted from pore pressure readings obtained during the performance of the CPT soundings.

Groundwater was not encountered in the hand auger borings.

### **Backfilling of Borings**

Once groundwater levels were obtained, boring spoils were backfilled into the open hand auger bore holes. CPT Soundings were not backfilled due to the small diameter of the hole.

REFERENCE ONLY



## CPT Soil Classification Legend

Zone	Color	Q <sub>t</sub> /N	Description
1	Dark Red	2	Sensitive, Fine Grained
2	Orange	1	Organic Soils-Peats
3	Blue	1.5	Clays-Clay to Silty Clay
4	Green	2	Silt Mixtures-Clayey Silt to Silty Clay
5	Light Green	3	Sand Mixtures-Silty Sand to Sandy Silt
6	Yellow	4.5	Sands-Clean Sand to Silty Sand
7	Olive Green	6	Gravelly Sand to Sand
8	Light Grey	1	Very Stiff Clay to Clayey Sand*
9	Dark Grey	2	Very Stiff, Fine Grained*

(\* ) Heavily Overconsolidated or Cemented

Robertson's Soil Behavior Type (SBT), 1990			
Group #	Description	I <sub>c</sub>	
		Min	Max
1	Sensitive, fine grained	N/A	
2	Organic soils - peats	3.60	N/A
3	Clays - silty clay to clay	2.95	3.60
4	Silt mixtures - clayey silt to silty clay	2.60	2.95
5	Sand mixtures - silty sand to sandy silt	2.05	2.60
6	Sands - clean sand to silty sand	1.31	2.05
7	Gravelly sand to dense sand	N/A	1.31
8	Very stiff sand to clayey sand (High OCR or cemented)	N/A	
9	Very stiff, fine grained (High OCR or cemented)	N/A	

Soil behavior type is based on empirical data and may not be representative of soil classification based on plasticity and grain size distribution.

Relative Density and Consistency Table			
SANDS		SILTS and CLAYS	
Cone Tip Stress, qt (tsf)	Relative Density	Cone Tip Stress, qt (tsf)	Consistency
Less than 20	Very Loose	Less than 5	Very Soft
20 - 40	Loose	5 - 15	Soft to Firm
40 - 120	Medium Dense	15 - 30	Stiff
120 - 200	Dense	30 - 60	Very Stiff
Greater than 200	Very Dense	Greater than 60	Hard

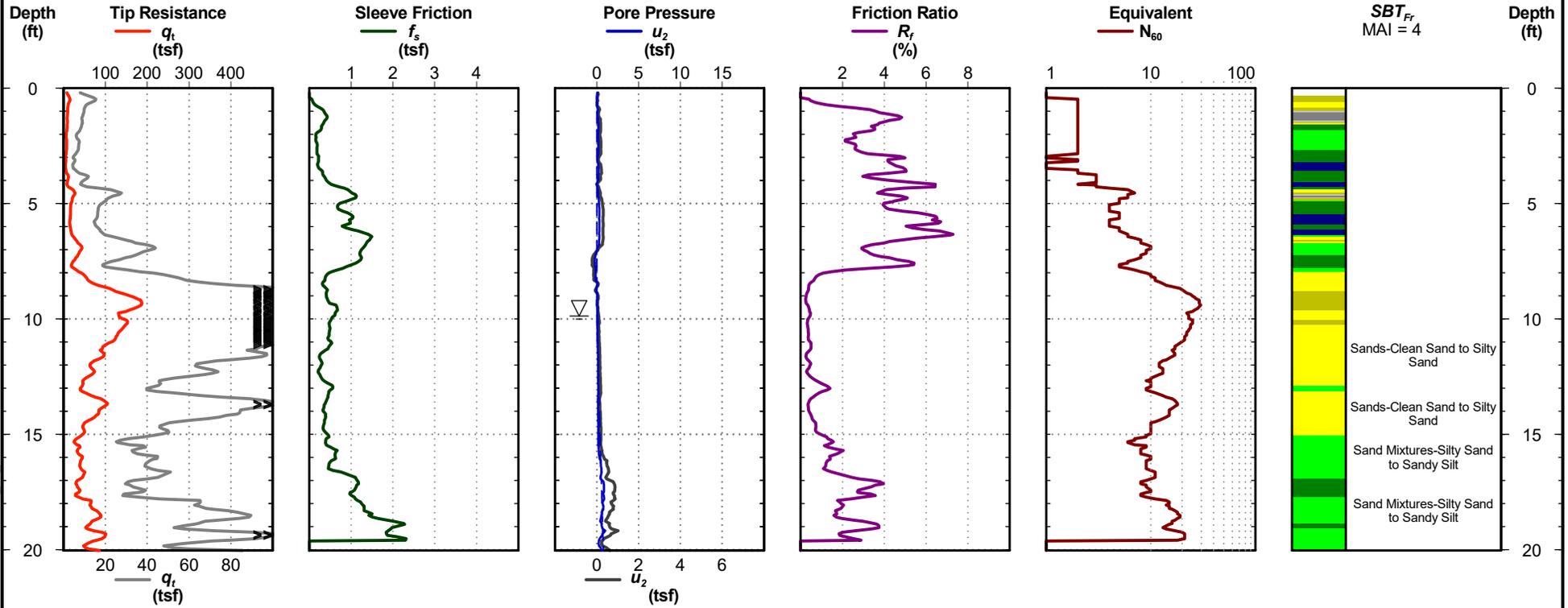


Florence Industrial Park  
Florence, South Carolina  
S&ME Project No: 1339-20-035

Sounding ID: C-1

Date: Oct. 19, 2020  
Estimated Water Depth: 10 ft  
Rig/Operator: EB/TC |

Total Depth: 20.0 ft  
Termination Criteria: Target Depth  
Cone Size: 1.75



REFERENCE ONLY

Cone Penetration Test

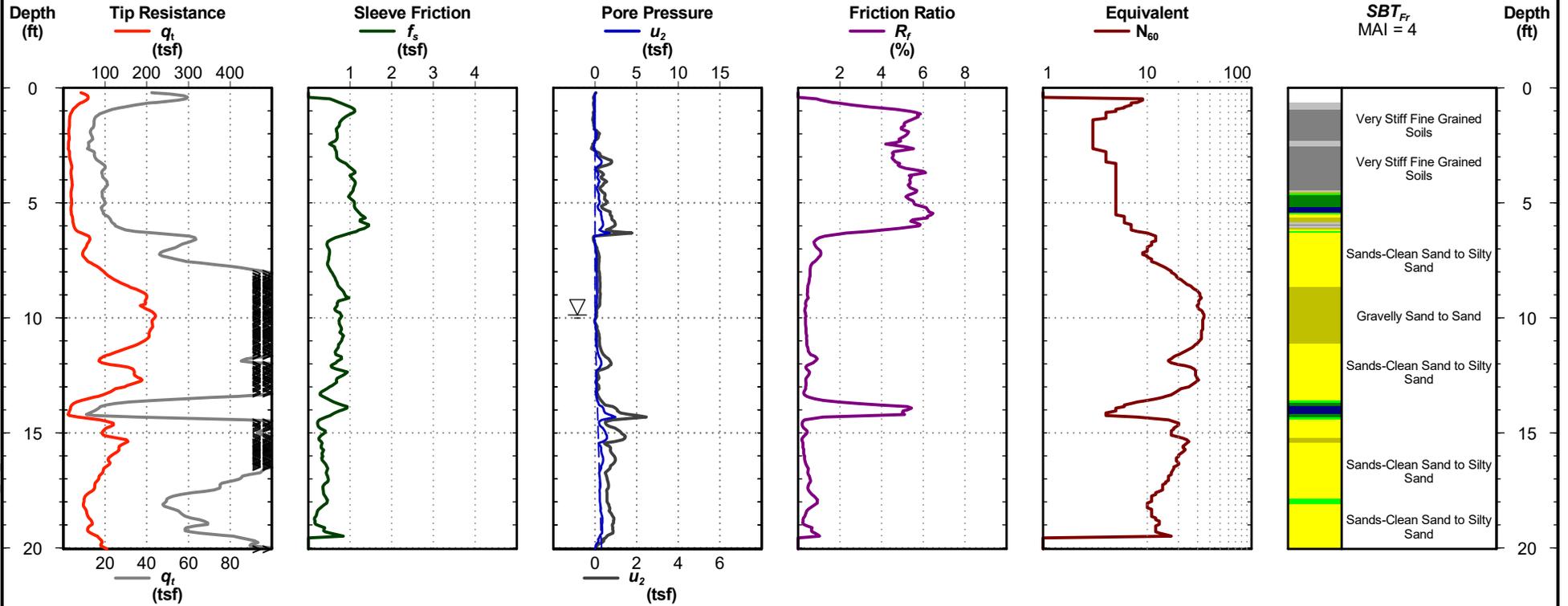


Florence Industrial Park  
Florence, South Carolina  
S&ME Project No: 1339-20-035

Sounding ID: C-2

Date: Oct. 19, 2020  
Estimated Water Depth: 10 ft  
Rig/Operator: EB/TC |

Total Depth: 20.0 ft  
Termination Criteria: Target Depth  
Cone Size: 1.75



REFERENCE ONLY

Cone Penetration Test

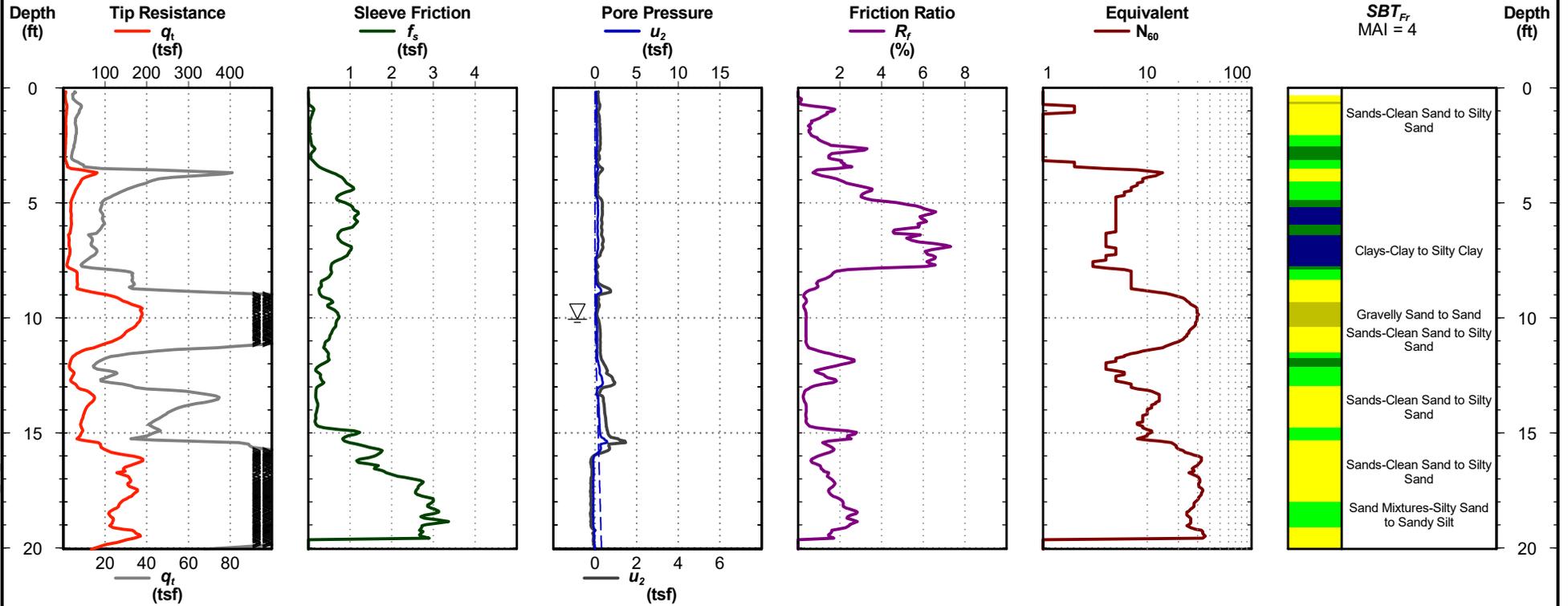


Florence Industrial Park  
Florence, South Carolina  
S&ME Project No: 1339-20-035

Sounding ID: C-3

Date: Oct. 19, 2020  
Estimated Water Depth: 10 ft  
Rig/Operator: EB/TC |

Total Depth: 20.1 ft  
Termination Criteria: Target Depth  
Cone Size: 1.75



REFERENCE ONLY

Cone Penetration Test

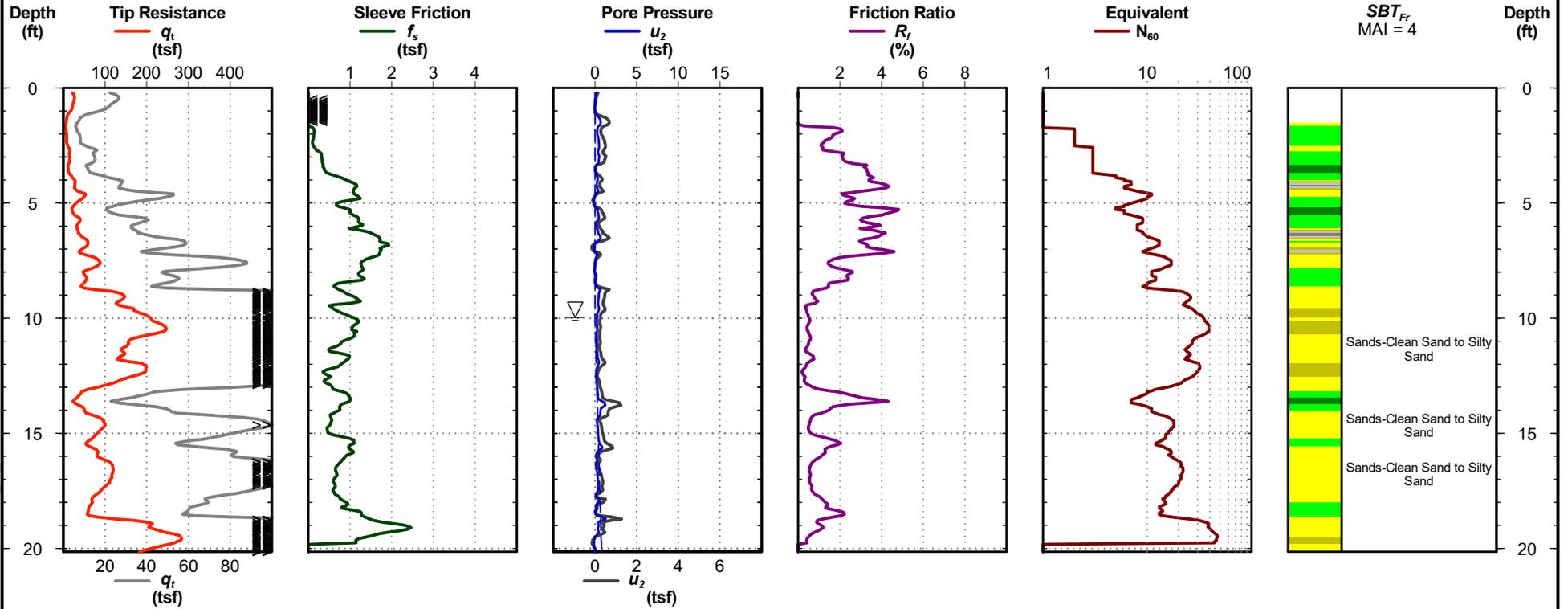


Florence Industrial Park  
Florence, South Carolina  
S&ME Project No: 1339-20-035

Sounding ID: C-4

Date: Oct. 19, 2020  
Estimated Water Depth: 10 ft  
Rig/Operator: EB/TC |

Total Depth: 20.2 ft  
Termination Criteria: Target Depth  
Cone Size: 1.75



REFERENCE ONLY

Cone Penetration Test

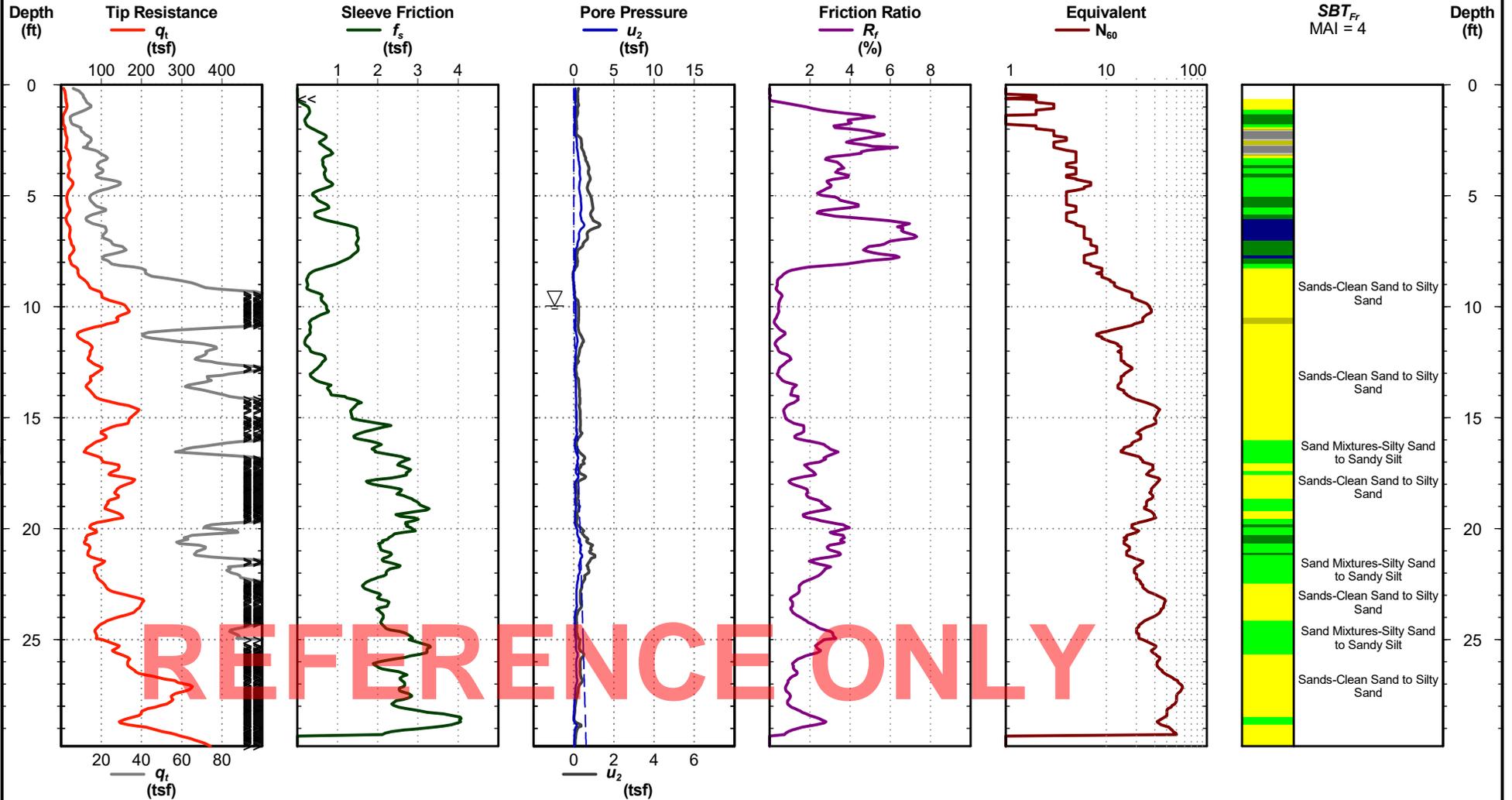


Florence Industrial Park  
Florence, South Carolina  
S&ME Project No: 1339-20-035

# Sounding ID: C-5

Date: Oct. 19, 2020  
Estimated Water Depth: 10 ft  
Rig/Operator: EB/TC |

Total Depth: 29.8 ft  
Termination Criteria: Maximum Reaction Force  
Cone Size: 1.75



## Cone Penetration Test

Electronic Filename: C-5\_PD.DAT

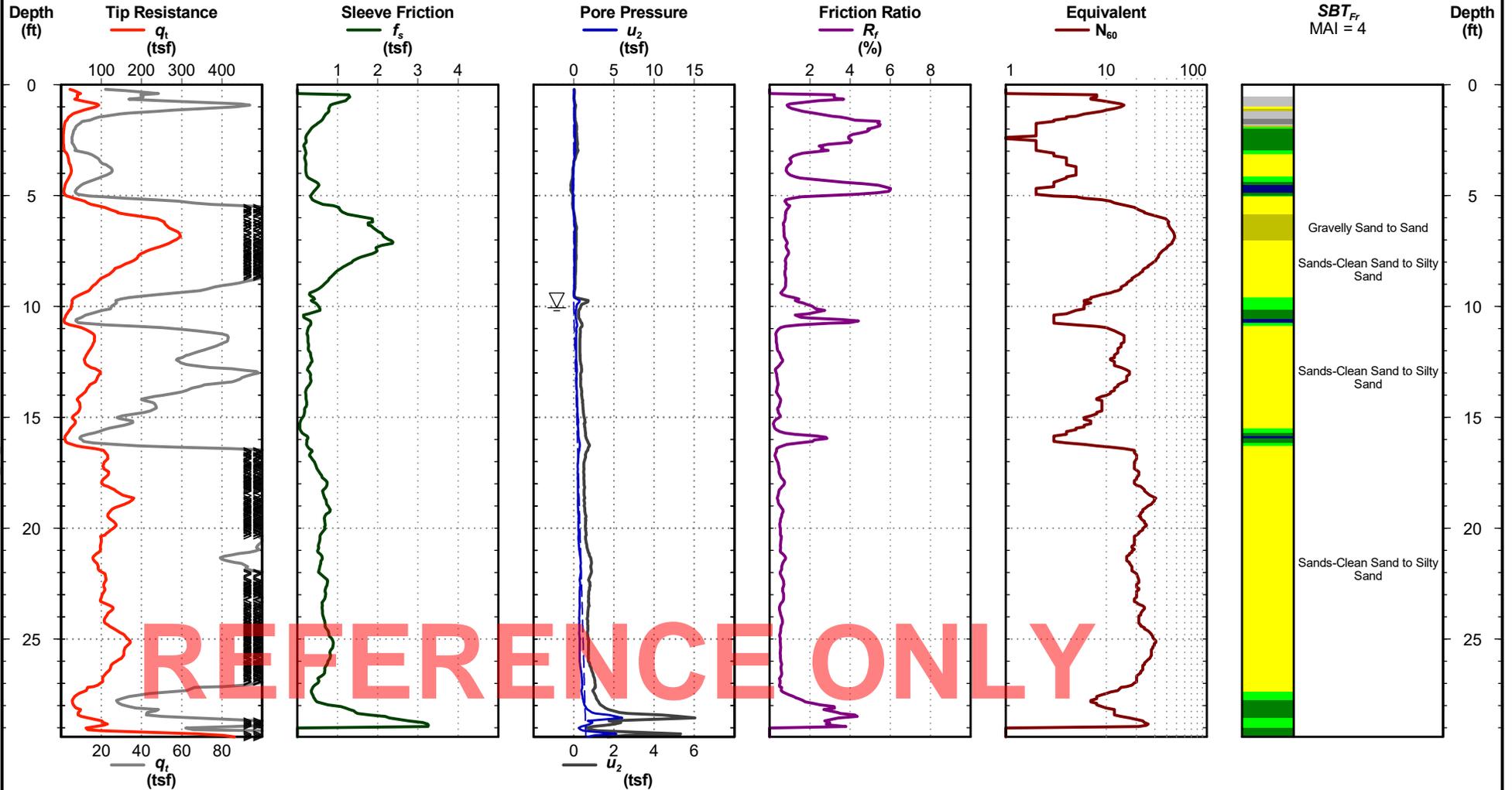


Florence Industrial Park  
Florence, South Carolina  
S&ME Project No: 1339-20-035

# Sounding ID: C-6

Date: Oct. 20, 2020  
Estimated Water Depth: 10 ft  
Rig/Operator: EB/TC |

Total Depth: 29.4 ft  
Termination Criteria: Target Depth  
Cone Size: 1.75



## Cone Penetration Test

Electronic Filename: C-6\_PD.DAT

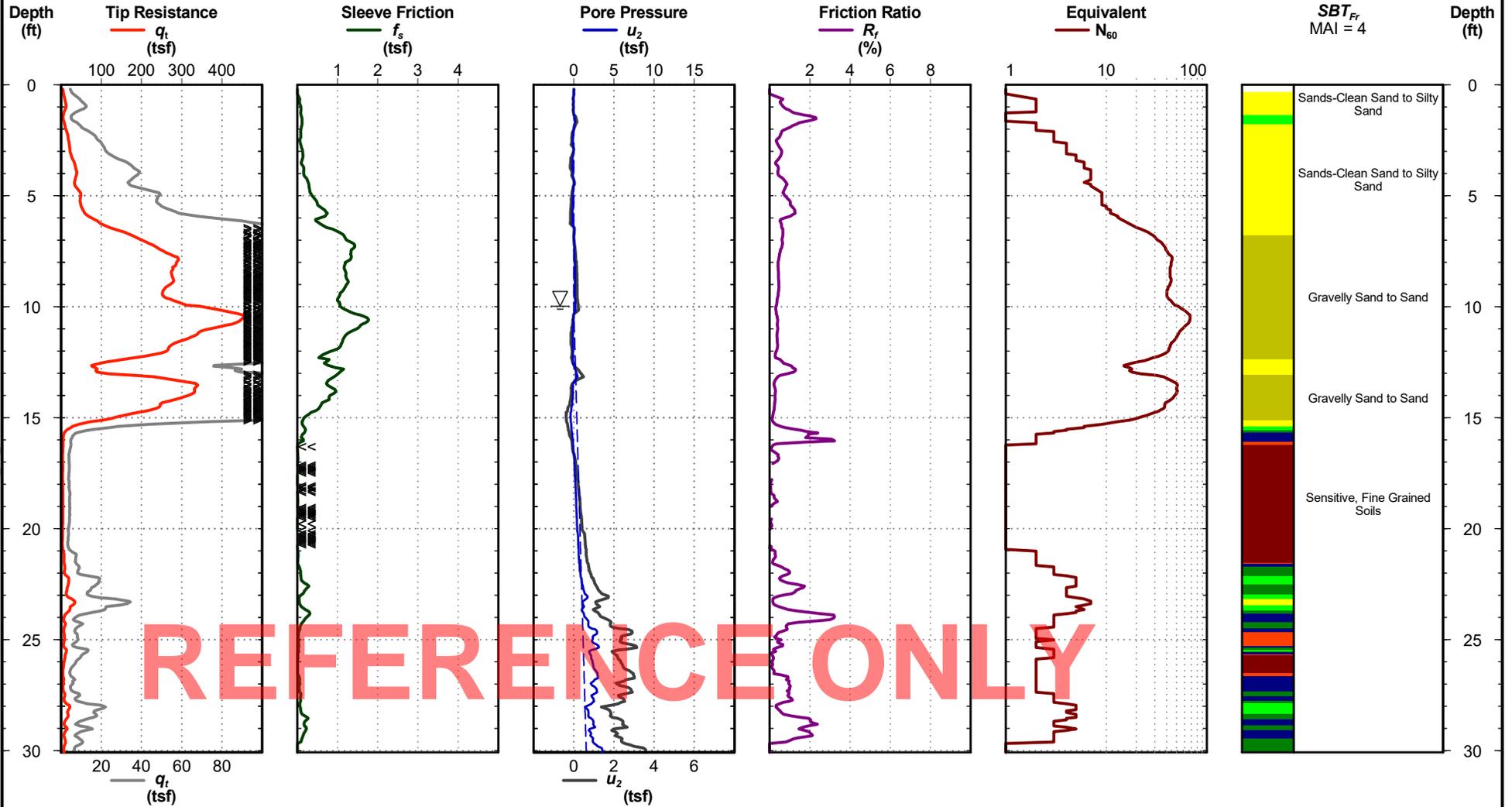


Florence Industrial Park  
Florence, South Carolina  
S&ME Project No: 1339-20-035

Sounding ID: C-7

Date: Oct. 20, 2020  
Estimated Water Depth: 10 ft  
Rig/Operator: EB/TC |

Total Depth: 30.1 ft  
Termination Criteria: Target Depth  
Cone Size: 1.75



Cone Penetration Test

Electronic Filename: C-7\_PD.DAT

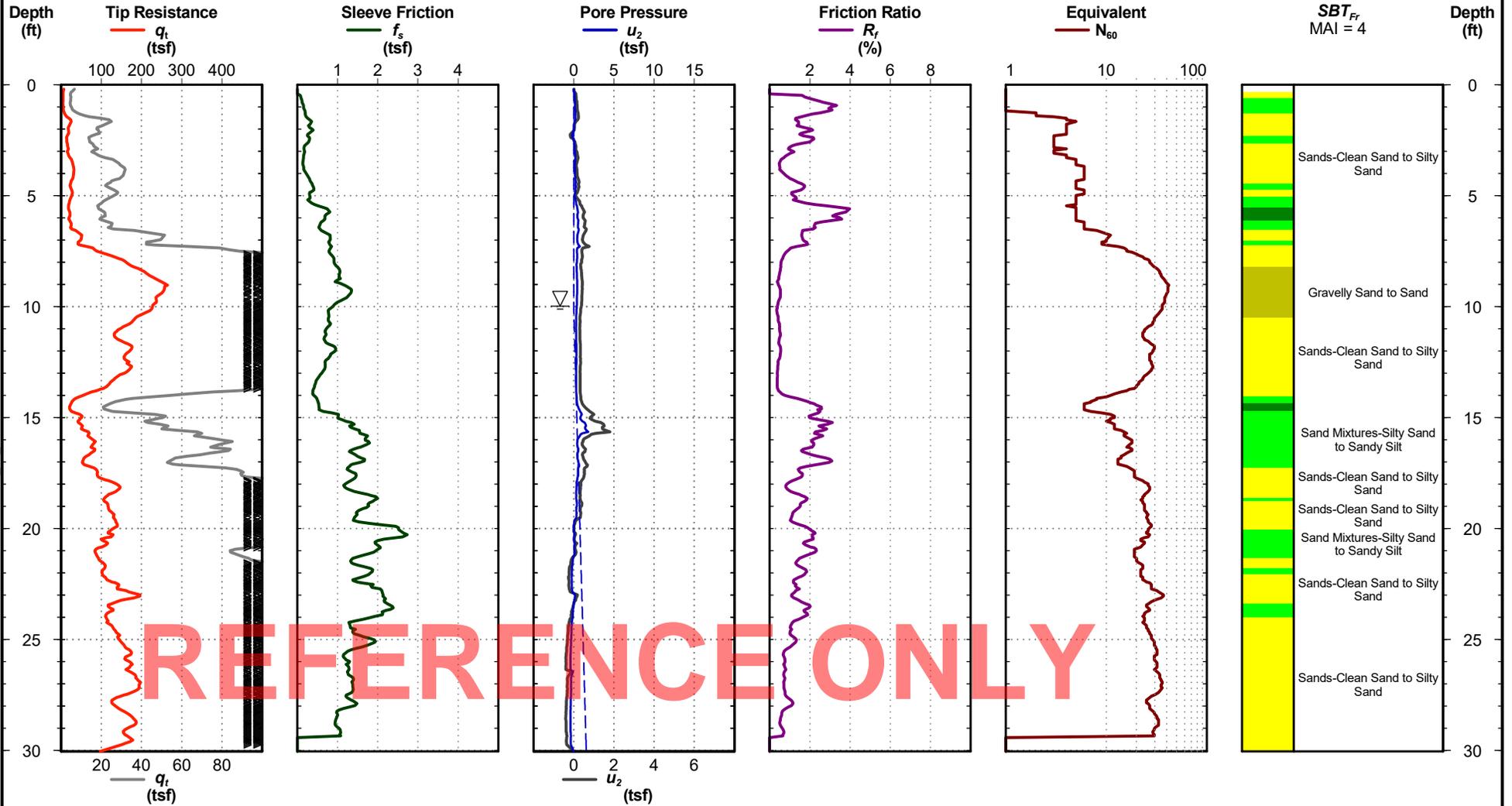


Florence Industrial Park  
Florence, South Carolina  
S&ME Project No: 1339-20-035

# Sounding ID: C-8

Date: Oct. 20, 2020  
Estimated Water Depth: 10 ft  
Rig/Operator: EB/TC |

Total Depth: 30.0 ft  
Termination Criteria: Target Depth  
Cone Size: 1.75



## Cone Penetration Test

Electronic Filename: C-8\_PD.DAT

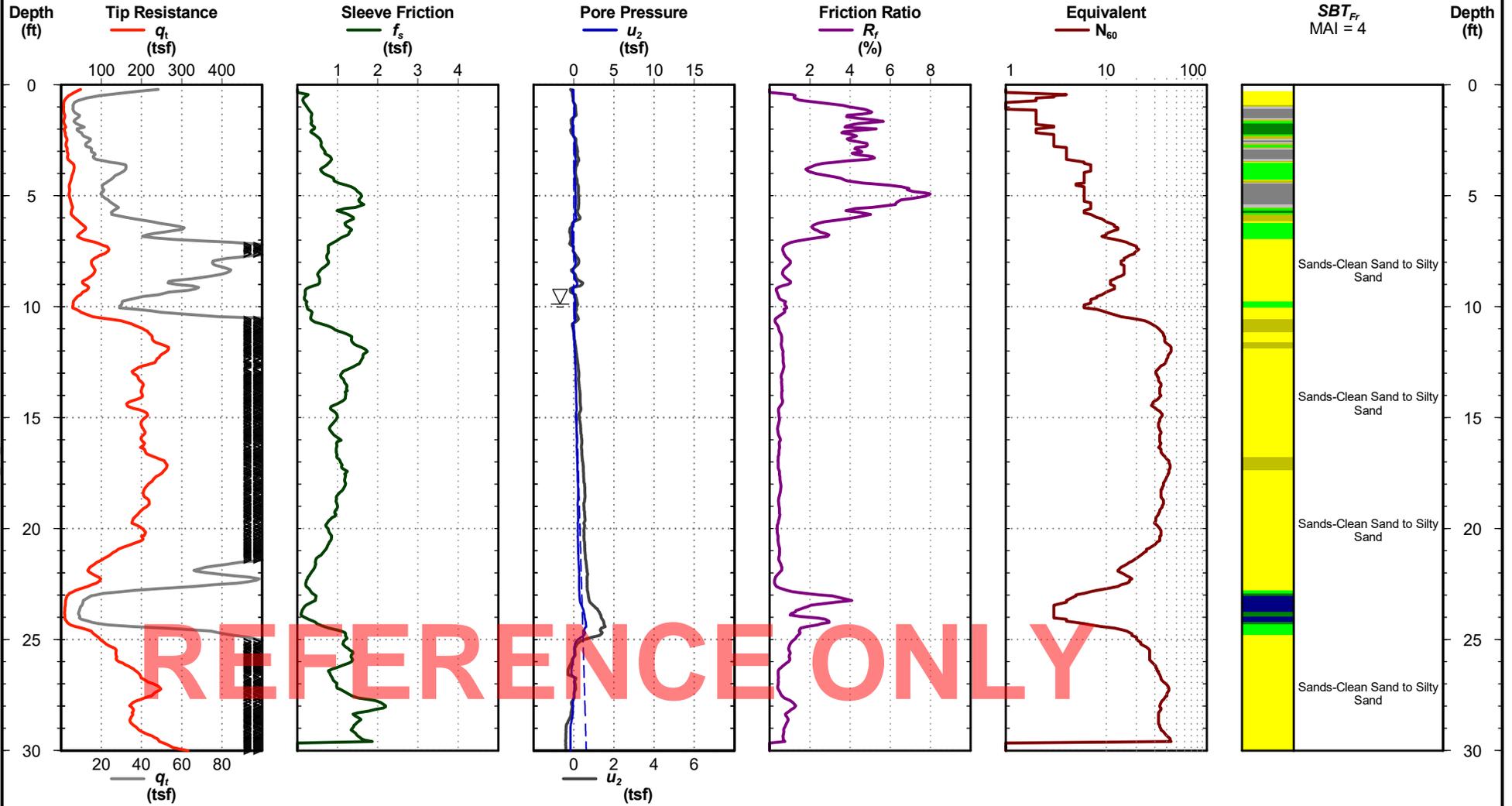


Florence Industrial Park  
Florence, South Carolina  
S&ME Project No: 1339-20-035

# Sounding ID: C-9

Date: Oct. 20, 2020  
Estimated Water Depth: 10 ft  
Rig/Operator: EB/TC |

Total Depth: 30.0 ft  
Termination Criteria: Target Depth  
Cone Size: 1.75



## Cone Penetration Test

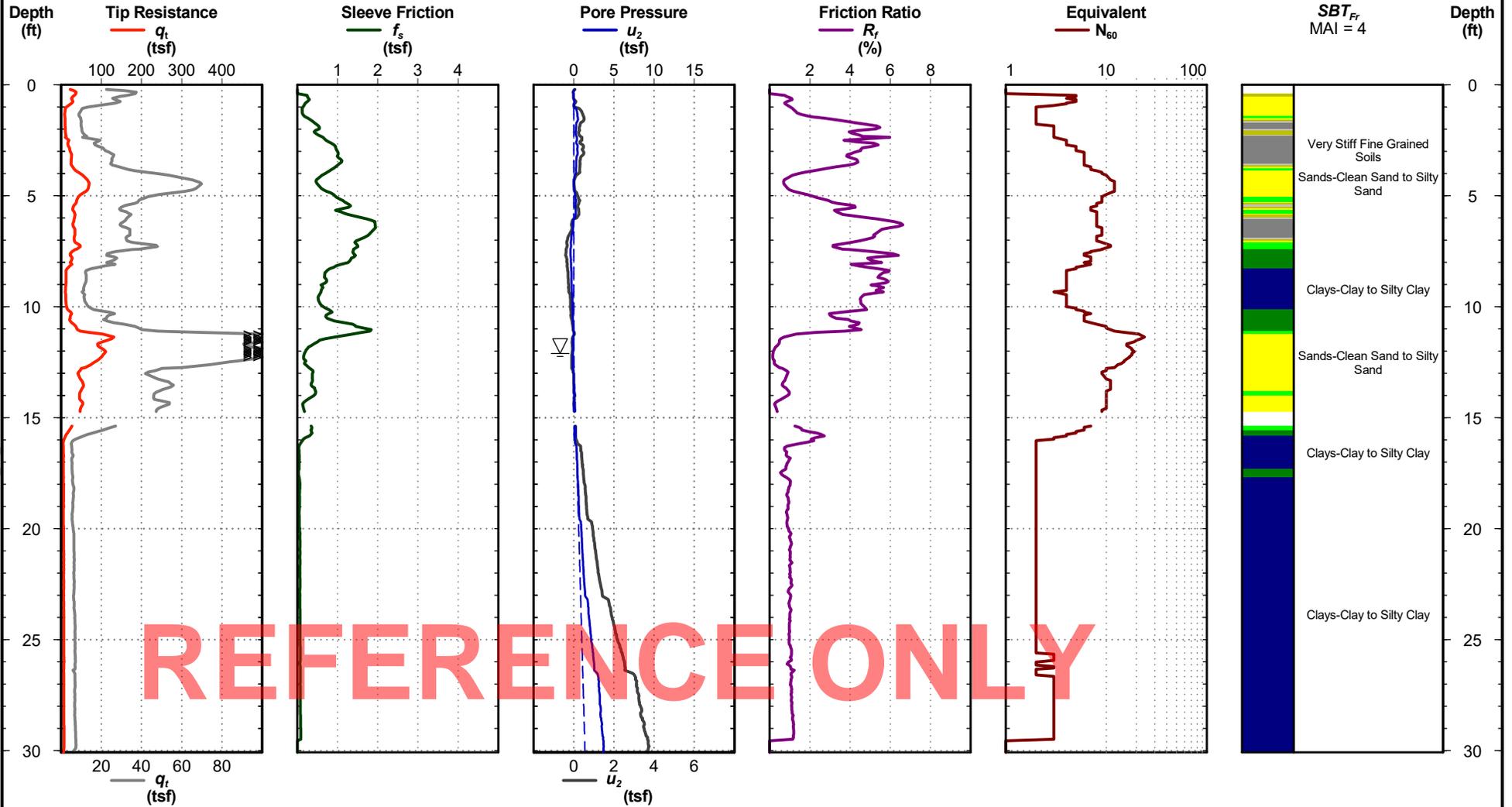
Electronic Filename: C-9\_PD.DAT



Florence Industrial Park  
Florence, South Carolina  
S&ME Project No: 1339-20-035

Date: Oct. 20, 2020  
Estimated Water Depth: 12 ft  
Rig/Operator: EB/TC |

**Sounding ID: C-10**  
Total Depth: 30.1 ft  
Termination Criteria: Target Depth  
Cone Size: 1.75



**Cone Penetration Test**

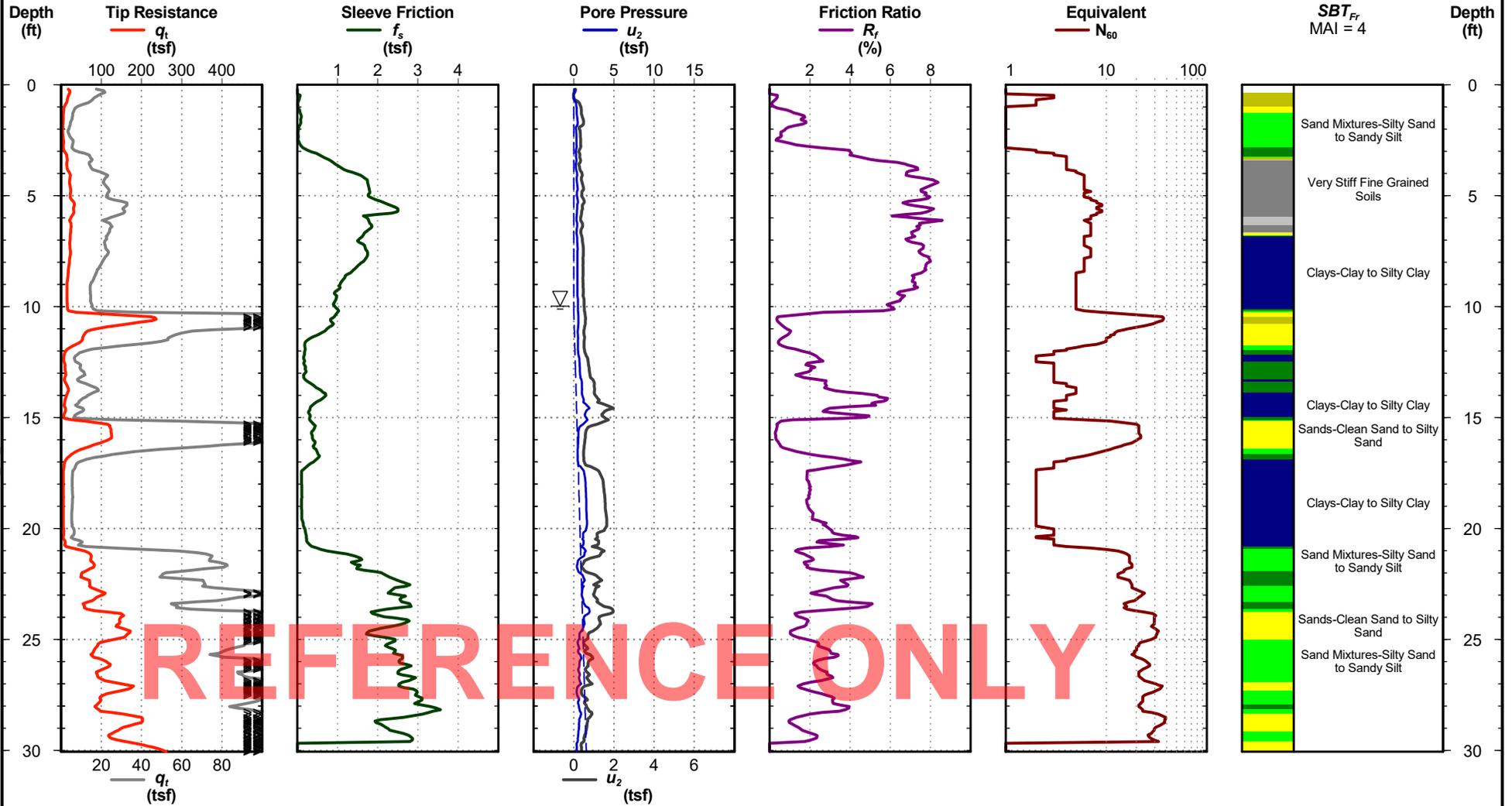


Florence Industrial Park  
Florence, South Carolina  
S&ME Project No: 1339-20-035

# Sounding ID: C-11

Date: Oct. 19, 2020  
Estimated Water Depth: 10 ft  
Rig/Operator: EB/TC |

Total Depth: 30.1 ft  
Termination Criteria: Target Depth  
Cone Size: 1.75



## Cone Penetration Test

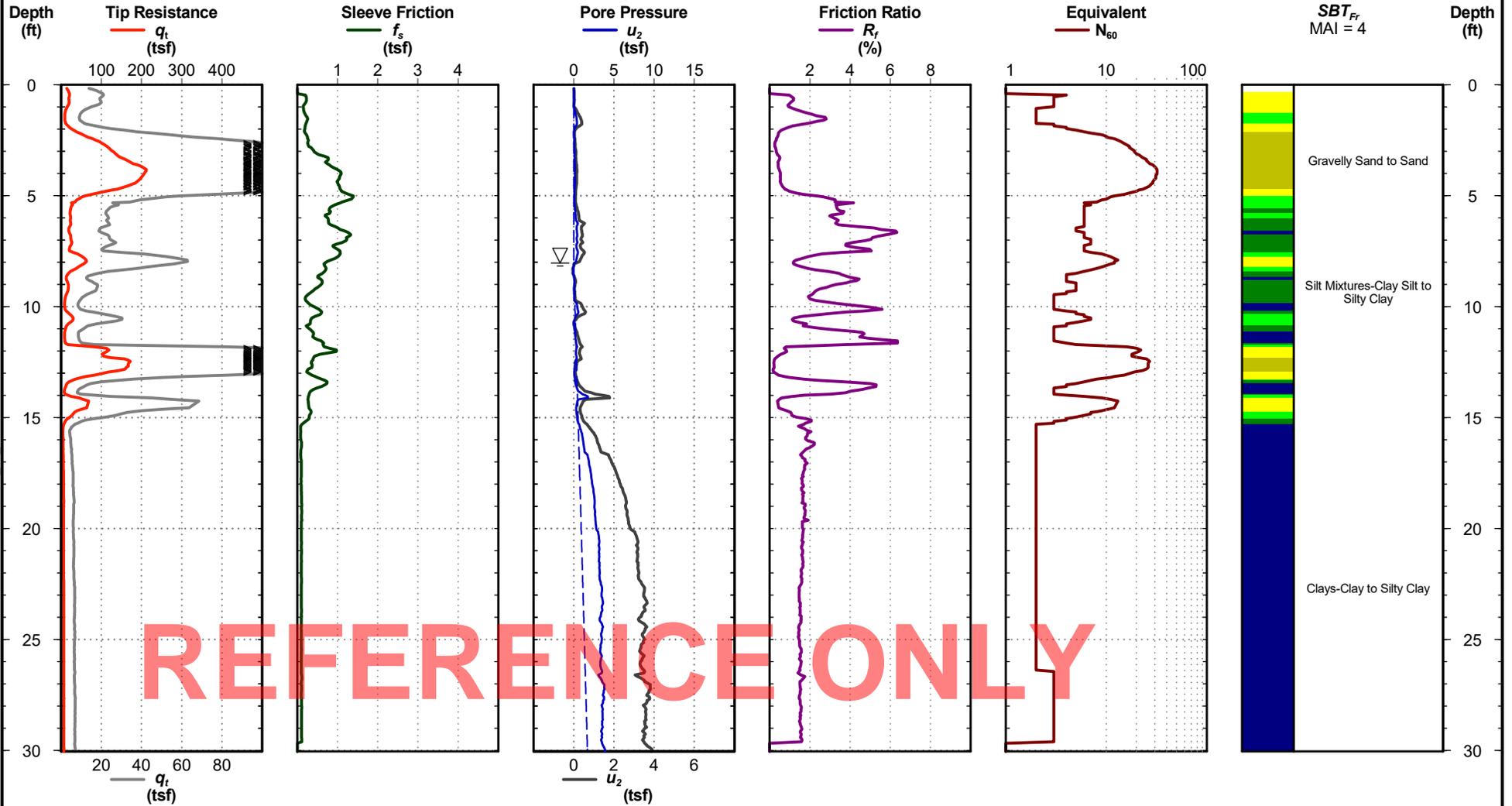
Electronic Filename: C-11\_PD.DAT



Florence Industrial Park  
Florence, South Carolina  
S&ME Project No: 1339-20-035

Date: Oct. 20, 2020  
Estimated Water Depth: 8 ft  
Rig/Operator: EB/TC |

**Sounding ID: C-12**  
Total Depth: 30.1 ft  
Termination Criteria: Target Depth  
Cone Size: 1.75



CPT REPORT - DYNAMIC FLORENCE INDUSTRIAL LOGS.GPJ \ LIBRARY.2011.06.28.GDT.11/11/20

**Cone Penetration Test**

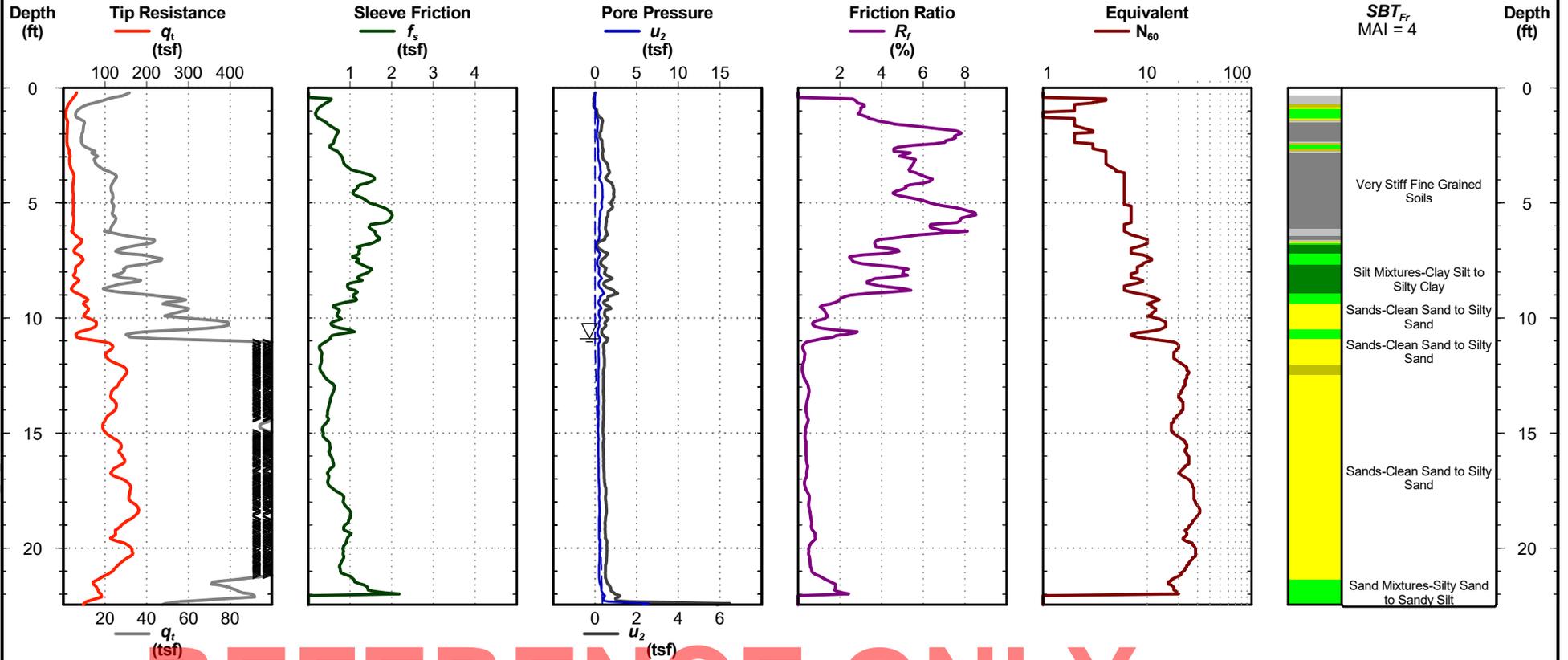


Florence Industrial Park  
Florence, South Carolina  
S&ME Project No: 1339-20-035

Sounding ID: C-13

Date: Oct. 20, 2020  
Estimated Water Depth: 11 ft  
Rig/Operator: EB/TC |

Total Depth: 22.5 ft  
Termination Criteria: Target Depth  
Cone Size: 1.75



REFERENCE ONLY

Cone Penetration Test

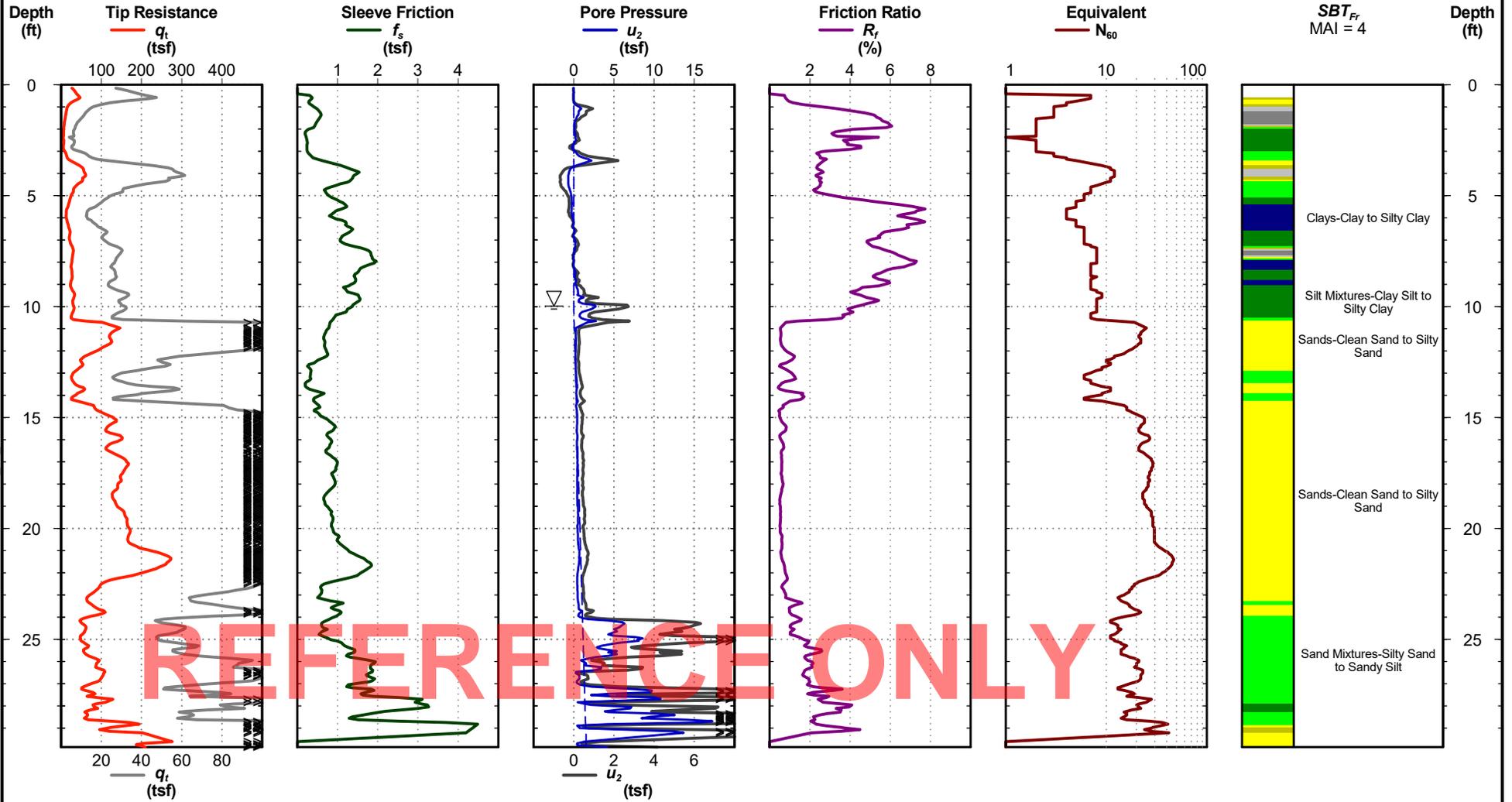


Florence Industrial Park  
Florence, South Carolina  
S&ME Project No: 1339-20-035

# Sounding ID: C-14

Date: Oct. 20, 2020  
Estimated Water Depth: 10 ft  
Rig/Operator: EB/TC |

Total Depth: 29.9 ft  
Termination Criteria: Target Depth  
Cone Size: 1.75



## Cone Penetration Test

Electronic Filename: C-14\_PD.DAT

# LEGEND TO SOIL CLASSIFICATION AND SYMBOLS

## SOIL TYPES

(Shown in Graphic Log)

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

## WATER LEVELS

(Shown in Water Level Column)

-  = Water Level At Termination of Boring
-  = Water Level Taken After 24 Hours
-  = Loss of Drilling Water
- HC = Hole Cave

## CONSISTENCY OF COHESIVE SOILS

### CONSISTENCY

Very Soft	STD. PENETRATION RESISTANCE BLOWS/FOOT
Soft	0 to 2
Firm	3 to 4
Stiff	5 to 8
Very Stiff	9 to 15
Hard	16 to 30
Very Hard	31 to 50
	Over 50

## RELATIVE DENSITY OF COHESIONLESS SOILS

### RELATIVE DENSITY

Very Loose	STD. PENETRATION RESISTANCE BLOWS/FOOT
Loose	0 to 4
Medium Dense	5 to 10
Dense	11 to 30
Very Dense	31 to 50
	Over 50

## SAMPLER TYPES

(Shown in Samples Column)

Shelby Tube

 Split Spoon

 Rock Core

 No Recovery

## TERMS

**Standard Penetration Resistance** - The Number of Blows of 140 lb. Hammer Falling 30 in. Required to Drive 1.4 in. I.D. Split Spoon Sampler 1 Foot. As Specified in ASTM D-1586.

**REC** - Total Length of Rock Recovered in the Core Barrel Divided by the Total Length of the Core Run Times 100%.

**RQD** - Total Length of Sound Rock Segments Recovered that are Longer Than or Equal to 4" (mechanical breaks excluded) Divided by the Total Length of the Core Run Times 100%.



PROJECT:		<b>Florence Industrial Park</b> <b>Florence, South Carolina</b> <b>1339-20-035</b>		<b>HAND AUGER BORING LOG: C-1</b>	
DATE STARTED: <b>10/22/20</b>		DATE FINISHED: <b>10/22/20</b>		NOTES: Elevation Unknown	
SAMPLING METHOD: <b>Hand Auger</b>		PERFORMED BY: <b>J. Prevatte</b>			
WATER LEVEL: <b>0.5' ATD</b>					
Depth (feet)	GRAPHIC LOG	MATERIAL DESCRIPTION	ELEVATION (feet)	WATER LEVEL	
		<b>TOPSOIL</b> - 6 inches.		▽	
1		<b>CLAYEY SAND (SC)</b> - Brown and orange to gray, mostly fine to medium sand, some low to medium plasticity fines, wet.			
2					
3					
4		Boring terminated at 4 ft Target Depth			

REFERENCE ONLY



DCP INDEX IS THE DEPTH (IN.) OF PENETRATION PER BLOW OF A 10.1 LB HAMMER FALLING 22.6 IN., DRIVING A 0.79 IN. O.D. 60 DEGREE CONE.

PROJECT: <b>Florence Industrial Park</b> Florence, South Carolina 1339-20-035		<b>HAND AUGER BORING LOG: C-2</b>		
DATE STARTED: <b>10/22/20</b>	DATE FINISHED: <b>10/22/20</b>	NOTES: Elevation Unknown		
SAMPLING METHOD: <b>Hand Auger</b>	PERFORMED BY: <b>J. Prevatte</b>			
WATER LEVEL: <b>2' ATD</b>				
Depth (feet)	GRAPHIC LOG	MATERIAL DESCRIPTION	ELEVATION (feet)	WATER LEVEL
		<b>TOPSOIL</b> - 6 inches.		
1		<b>CLAYEY SAND (SC)</b> - Tan and orange to gray, mostly fine to medium sand, some low to medium plasticity fines, moist to wet.		▽
2				
3				
4		Boring terminated at 4 ft Target Depth		

REFERENCE ONLY



DCP INDEX IS THE DEPTH (IN.) OF PENETRATION PER BLOW OF A 10.1 LB HAMMER FALLING 22.6 IN., DRIVING A 0.79 IN. O.D. 60 DEGREE CONE.

PROJECT: <b>Florence Industrial Park</b> <b>Florence, South Carolina</b> <b>1339-20-035</b>		<b>HAND AUGER BORING LOG: C-3</b>		
DATE STARTED: <b>10/22/20</b>	DATE FINISHED: <b>10/22/20</b>	NOTES: Elevation Unknown		
SAMPLING METHOD: <b>Hand Auger</b>	PERFORMED BY: <b>J. Prevatte</b>			
WATER LEVEL: <b>1' ATD</b>				
Depth (feet)	GRAPHIC LOG	MATERIAL DESCRIPTION	ELEVATION (feet)	WATER LEVEL
		<b>TOPSOIL</b> - 8 inches.		
1		<b>CLAYEY SAND (SC)</b> - Orange and gray, mostly fine to medium sand, some low to medium plasticity fines, moist to wet.		▽
2				-
3				-
4		Boring terminated at 4 ft Target Depth		-

REFERENCE ONLY



DCP INDEX IS THE DEPTH (IN.) OF PENETRATION PER BLOW OF A 10.1 LB HAMMER FALLING 22.6 IN., DRIVING A 0.79 IN. O.D. 60 DEGREE CONE.

PROJECT: <b>Florence Industrial Park</b> Florence, South Carolina 1339-20-035		<b>HAND AUGER BORING LOG: C-4</b>		
DATE STARTED: <b>10/22/20</b>	DATE FINISHED: <b>10/22/20</b>	NOTES: Elevation Unknown		
SAMPLING METHOD: <b>Hand Auger</b>	PERFORMED BY: <b>J. Prevatte</b>			
WATER LEVEL: <b>2.5' ATD</b>				
Depth (feet)	GRAPHIC LOG	MATERIAL DESCRIPTION	ELEVATION (feet)	WATER LEVEL
		<b>TOPSOIL</b> - 10 inches.		
1		<b>CLAYEY SAND (SC)</b> - Orange and gray, mostly fine to medium sand, some low to medium plasticity fines, moist to wet.		-
2				-
3				▽
4		Boring terminated at 4 ft Target Depth		-

REFERENCE ONLY



DCP INDEX IS THE DEPTH (IN.) OF PENETRATION PER BLOW OF A 10.1 LB HAMMER FALLING 22.6 IN., DRIVING A 0.79 IN. O.D. 60 DEGREE CONE.

PROJECT: <b>Florence Industrial Park</b> Florence, South Carolina 1339-20-035		<b>HAND AUGER BORING LOG: C-5</b>		
DATE STARTED: <b>10/22/20</b>	DATE FINISHED: <b>10/22/20</b>	NOTES: Elevation Unknown		
SAMPLING METHOD: <b>Hand Auger</b>	PERFORMED BY: <b>J. Prevatte</b>			
WATER LEVEL: <b>3' ATD</b>				
Depth (feet)	GRAPHIC LOG	MATERIAL DESCRIPTION	ELEVATION (feet)	WATER LEVEL
		<b>TOPSOIL</b> - 10 inches.		
1		<b>CLAYEY SAND (SC)</b> - Brown to orange and gray, mostly fine to medium sand, some low to medium plasticity fines, moist to wet.		-
2				-
3				▽
4		Boring terminated at 4 ft Target Depth		

REFERENCE ONLY



DCP INDEX IS THE DEPTH (IN.) OF PENETRATION PER BLOW OF A 10.1 LB HAMMER FALLING 22.6 IN., DRIVING A 0.79 IN. O.D. 60 DEGREE CONE.

PROJECT: <b>Florence Industrial Park</b> Florence, South Carolina 1339-20-035		<b>HAND AUGER BORING LOG: C-6</b>		
DATE STARTED: <b>10/22/20</b>	DATE FINISHED: <b>10/22/20</b>	NOTES: Elevation Unknown		
SAMPLING METHOD: <b>Hand Auger</b>	PERFORMED BY: <b>J. Prevatte</b>			
WATER LEVEL: <b>1' ATD</b>				
Depth (feet)	GRAPHIC LOG	MATERIAL DESCRIPTION	ELEVATION (feet)	WATER LEVEL
		<b>TOPSOIL</b> - 10 inches.		
1		<b>CLAYEY SAND (SC)</b> - Orange and gray, mostly fine to medium sand, some low to medium plasticity fines, wet.		▽
2				-
3				-
4		Boring terminated at 4 ft Target Depth		-

REFERENCE ONLY



DCP INDEX IS THE DEPTH (IN.) OF PENETRATION PER BLOW OF A 10.1 LB HAMMER FALLING 22.6 IN., DRIVING A 0.79 IN. O.D. 60 DEGREE CONE.

PROJECT: <b>Florence Industrial Park</b> Florence, South Carolina 1339-20-035		<b>HAND AUGER BORING LOG: C-7</b>		
DATE STARTED: <b>10/22/20</b>	DATE FINISHED: <b>10/22/20</b>	NOTES: Elevation Unknown		
SAMPLING METHOD: <b>Hand Auger</b>	PERFORMED BY: <b>J. Prevatte</b>			
WATER LEVEL: <b>At Ground Surface</b>				
Depth (feet)	GRAPHIC LOG	MATERIAL DESCRIPTION	ELEVATION (feet)	WATER LEVEL
		<b>TOPSOIL</b> - 10 inches.		
1		<b>CLAYEY SAND (SC)</b> - Brown to orange and gray, mostly fine to medium sand, some low to medium plasticity fines, wet.		-
2				-
3				-
4		Boring terminated at 4 ft Target Depth		-

REFERENCE ONLY



DCP INDEX IS THE DEPTH (IN.) OF PENETRATION PER BLOW OF A 10.1 LB HAMMER FALLING 22.6 IN., DRIVING A 0.79 IN. O.D. 60 DEGREE CONE.

PROJECT:		<b>Florence Industrial Park</b> Florence, South Carolina 1339-20-035		<b>HAND AUGER BORING LOG: C-8</b>	
DATE STARTED: <b>10/22/20</b>		DATE FINISHED: <b>10/22/20</b>		NOTES: Elevation Unknown	
SAMPLING METHOD: <b>Hand Auger</b>		PERFORMED BY: <b>J. Prevatte</b>			
WATER LEVEL: <b>At Ground Surface</b>					
Depth (feet)	GRAPHIC LOG	MATERIAL DESCRIPTION		ELEVATION (feet)	WATER LEVEL
		TOPSOIL - 10 inches.			
1		<b>CLAYEY SAND (SC)</b> - Brown to orange and gray, mostly fine to medium sand, some low to medium plasticity fines, wet.			-
2					-
3					-
4		Boring terminated at 4 ft Target Depth			-

REFERENCE ONLY



DCP INDEX IS THE DEPTH (IN.) OF PENETRATION PER BLOW OF A 10.1 LB HAMMER FALLING 22.6 IN., DRIVING A 0.79 IN. O.D. 60 DEGREE CONE.

PROJECT: <b>Florence Industrial Park</b> <b>Florence, South Carolina</b> <b>1339-20-035</b>		<b>HAND AUGER BORING LOG: C-9</b>		
DATE STARTED: <b>10/22/20</b>	DATE FINISHED: <b>10/22/20</b>	NOTES: Elevation Unknown		
SAMPLING METHOD: <b>Hand Auger</b>	PERFORMED BY: <b>J. Prevatte</b>			
WATER LEVEL: <b>Not Encountered</b>				
Depth (feet)	GRAPHIC LOG	MATERIAL DESCRIPTION	ELEVATION (feet)	WATER LEVEL
		<b>TOPSOIL</b> - 8 inches.		
1		<b>SILTY SAND (SM)</b> - Tan, mostly fine to medium sand, some low plasticity to non plastic fines, moist.		-
2		<b>CLAYEY SAND (SC)</b> - Orange and gray, mostly fine to medium sand, some low to medium plasticity fines, moist to wet.		-
3		<h1 style="color: red; opacity: 0.5;">REFERENCE ONLY</h1>		-
4			Boring terminated at 4 ft Target Depth	



DCP INDEX IS THE DEPTH (IN.) OF PENETRATION PER BLOW OF A 10.1 LB HAMMER FALLING 22.6 IN., DRIVING A 0.79 IN. O.D. 60 DEGREE CONE.

PROJECT:		<b>Florence Industrial Park</b> <b>Florence, South Carolina</b> <b>1339-20-035</b>		<b>HAND AUGER BORING LOG: C-10</b>	
DATE STARTED: <b>10/22/20</b>		DATE FINISHED: <b>10/22/20</b>		NOTES: Elevation Unknown	
SAMPLING METHOD: <b>Hand Auger</b>		PERFORMED BY: <b>J. Prevatte</b>			
WATER LEVEL: <b>1' ATD</b>					
Depth (feet)	GRAPHIC LOG	MATERIAL DESCRIPTION	ELEVATION (feet)	WATER LEVEL	
		<b>TOPSOIL</b> - 10 inches.			
1		<b>CLAYEY SAND (SC)</b> - Brown to orange and gray, mostly fine to medium sand, some low to medium plasticity fines, moist to wet.		▽	
2				-	
3				-	
4		Boring terminated at 4 ft Target Depth		-	

REFERENCE ONLY



DCP INDEX IS THE DEPTH (IN.) OF PENETRATION PER BLOW OF A 10.1 LB HAMMER FALLING 22.6 IN., DRIVING A 0.79 IN. O.D. 60 DEGREE CONE.

PROJECT: <b>Florence Industrial Park</b> Florence, South Carolina 1339-20-035		<b>HAND AUGER BORING LOG: C-11</b>	
DATE STARTED: <b>10/22/20</b>		DATE FINISHED: <b>10/22/20</b>	
SAMPLING METHOD: <b>Hand Auger</b>		PERFORMED BY: <b>J. Prevatte</b>	
WATER LEVEL: <b>1.5' ATD</b>		NOTES: Elevation Unknown	
Depth (feet)	GRAPHIC LOG	MATERIAL DESCRIPTION	ELEVATION (feet)
		<b>TOPSOIL</b> - 8 inches.	
1		<b>CLAYEY SAND (SC)</b> - Brown to orange and gray, mostly fine to medium sand, some low to medium plasticity fines, moist to wet.	▽
2			
3			
4		Boring terminated at 4 ft Target Depth	

REFERENCE ONLY



DCP INDEX IS THE DEPTH (IN.) OF PENETRATION PER BLOW OF A 10.1 LB HAMMER FALLING 22.6 IN., DRIVING A 0.79 IN. O.D. 60 DEGREE CONE.

PROJECT:		<b>Florence Industrial Park</b> Florence, South Carolina 1339-20-035		<b>HAND AUGER BORING LOG: C-12</b>	
DATE STARTED: <b>10/22/20</b>		DATE FINISHED: <b>10/22/20</b>		NOTES: Elevation Unknown	
SAMPLING METHOD: <b>Hand Auger</b>		PERFORMED BY: <b>J. Prevatte</b>			
WATER LEVEL: <b>Not encountered</b>					
Depth (feet)	GRAPHIC LOG	MATERIAL DESCRIPTION		ELEVATION (feet)	WATER LEVEL
		TOPSOIL - 10 inches.			
1		CLAYEY SAND (SC) - Brown to orange and gray, mostly fine to medium sand, some low to medium plasticity fines, moist to wet.			-
2					-
3					-
4		Boring terminated at 4 ft Target Depth			

REFERENCE ONLY



DCP INDEX IS THE DEPTH (IN.) OF PENETRATION PER BLOW OF A 10.1 LB HAMMER FALLING 22.6 IN., DRIVING A 0.79 IN. O.D. 60 DEGREE CONE.

PROJECT:		<b>Florence Industrial Park</b> Florence, South Carolina 1339-20-035		<b>HAND AUGER BORING LOG: C-13</b>	
DATE STARTED: <b>10/22/20</b>		DATE FINISHED: <b>10/22/20</b>		NOTES: Elevation Unknown	
SAMPLING METHOD: <b>Hand Auger</b>		PERFORMED BY: <b>J. Prevatte</b>			
WATER LEVEL: <b>Not Encountered</b>					
Depth (feet)	GRAPHIC LOG	MATERIAL DESCRIPTION		ELEVATION (feet)	WATER LEVEL
		TOPSOIL - 10 inches.			
1		CLAYEY SAND (SC) - Brown to orange and gray, mostly fine to medium sand, some low to medium plasticity fines, moist to wet.			-
2					-
3					-
4		Boring terminated at 4 ft Target Depth			

REFERENCE ONLY



DCP INDEX IS THE DEPTH (IN.) OF PENETRATION PER BLOW OF A 10.1 LB HAMMER FALLING 22.6 IN., DRIVING A 0.79 IN. O.D. 60 DEGREE CONE.

PROJECT:		<b>Florence Industrial Park</b> Florence, South Carolina 1339-20-035		<b>HAND AUGER BORING LOG: C-14</b>	
DATE STARTED: <b>10/22/20</b>		DATE FINISHED: <b>10/22/20</b>		NOTES: Elevation Unknown	
SAMPLING METHOD: <b>Hand Auger</b>		PERFORMED BY: <b>J. Prevatte</b>			
WATER LEVEL: <b>Not Encountered</b>					
Depth (feet)	GRAPHIC LOG	MATERIAL DESCRIPTION	ELEVATION (feet)	WATER LEVEL	
		<b>TOPSOIL</b> - 10 inches.			
1		<b>CLAYEY SAND (SC)</b> - Brown to orange and gray, mostly fine to medium sand, some low to medium plasticity fines, moist to wet.		-	
2				-	
3				-	
4		Boring terminated at 4 ft Target Depth		-	

REFERENCE ONLY



DCP INDEX IS THE DEPTH (IN.) OF PENETRATION PER BLOW OF A 10.1 LB HAMMER FALLING 22.6 IN., DRIVING A 0.79 IN. O.D. 60 DEGREE CONE.

PROJECT:		Florence Industrial Park Florence, South Carolina 1339-20-035		HAND AUGER BORING LOG: HA-1		
DATE STARTED: 10/22/20		DATE FINISHED: 10/22/20		NOTES: Elevation Unknown		
SAMPLING METHOD: Hand Auger		PERFORMED BY: J. Prevatte				
WATER LEVEL: Not Encountered						
Depth (feet)	GRAPHIC LOG	MATERIAL DESCRIPTION	ELEVATION (feet)	WATER LEVEL	DYNAMIC CONE PENETRATION RESISTANCE (blows/1.75 in.)	DCP VALUE
		TOPSOIL - 8 inches.			10 20 30 60 80	4
1		CLAYEY SAND (SC) - Very loose to loose, orange and gray, mostly fine to medium sand, some low to medium plasticity fines, moist to wet.				5
2						4
3						4
4						5
5			Boring terminated at 5 ft Target Depth			

REFERENCE ONLY



DCP INDEX IS THE DEPTH (IN.) OF PENETRATION PER BLOW OF A 10.1 LB HAMMER FALLING 22.6 IN., DRIVING A 0.79 IN. O.D. 60 DEGREE CONE.

PROJECT:		Florence Industrial Park Florence, South Carolina 1339-20-035		HAND AUGER BORING LOG: HA-2		
DATE STARTED: 10/22/20		DATE FINISHED: 10/22/20		NOTES: Elevation Unknown		
SAMPLING METHOD: Hand Auger		PERFORMED BY: J. Prevatte				
WATER LEVEL: Not Encountered						
Depth (feet)	GRAPHIC LOG	MATERIAL DESCRIPTION	ELEVATION (feet)	WATER LEVEL	DYNAMIC CONE PENETRATION RESISTANCE (blows/1.75 in.)	DCP VALUE
		TOPSOIL - 6 inches.			10 20 30 60 80	3
1		CLAYEY SAND (SC) - Very loose, brown to orange and gray, mostly fine to medium sand, some low to medium plasticity fines, wet.				4
2						3
3						4
4						4
5			Boring terminated at 5 ft Target Depth			

REFERENCE ONLY



DCP INDEX IS THE DEPTH (IN.) OF PENETRATION PER BLOW OF A 10.1 LB HAMMER FALLING 22.6 IN., DRIVING A 0.79 IN. O.D. 60 DEGREE CONE.

PROJECT:		Florence Industrial Park Florence, South Carolina 1339-20-035		HAND AUGER BORING LOG: HA-3		
DATE STARTED: 10/22/20		DATE FINISHED: 10/22/20		NOTES: Elevation Unknown		
SAMPLING METHOD: Hand Auger		PERFORMED BY: J. Prevatte				
WATER LEVEL: 0.5' ATD						
Depth (feet)	GRAPHIC LOG	MATERIAL DESCRIPTION	ELEVATION (feet)	WATER LEVEL	DYNAMIC CONE PENETRATION RESISTANCE (blows/1.75 in.)	DCP VALUE
		TOPSOIL - 8 inches.		▽	10 20 30 60 80	2
1		CLAYEY SAND (SC) - Very loose to loose, brown to orange and gray, mostly fine to medium sand, some low to medium plasticity fines, moist to wet.		-	10 20 30 60 80	3
2				-	10 20 30 60 80	3
3				-	10 20 30 60 80	5
4				-	10 20 30 60 80	6
5			Boring terminated at 5 ft Target Depth		-	10 20 30 60 80

REFERENCE ONLY



DCP INDEX IS THE DEPTH (IN.) OF PENETRATION PER BLOW OF A 10.1 LB HAMMER FALLING 22.6 IN., DRIVING A 0.79 IN. O.D. 60 DEGREE CONE.

PROJECT:		Florence Industrial Park Florence, South Carolina 1339-20-035		HAND AUGER BORING LOG: HA-4		
DATE STARTED:		10/22/20	DATE FINISHED:		10/22/20	
SAMPLING METHOD:		Hand Auger	PERFORMED BY:		J. Prevatte	
WATER LEVEL:		1' ATD				
NOTES: Elevation Unknown						
Depth (feet)	GRAPHIC LOG	MATERIAL DESCRIPTION	ELEVATION (feet)	WATER LEVEL	DYNAMIC CONE PENETRATION RESISTANCE (blows/1.75 in.)	DCP VALUE
		TOPSOIL - 12 inches.				2
1		CLAYEY SAND (SC) - Very loose to loose, brown to orange and gray, mostly fine to medium sand, some low to medium plasticity fines, moist to wet.		▽		3
2						3
3						4
4						5
5			Boring terminated at 5 ft Target Depth			

REFERENCE ONLY

DCP INDEX IS THE DEPTH (IN.) OF PENETRATION PER BLOW OF A 10.1 LB HAMMER FALLING 22.6 IN., DRIVING A 0.79 IN. O.D. 60 DEGREE CONE.



PROJECT:		<b>Florence Industrial Park</b> <b>Florence, South Carolina</b> <b>1339-20-035</b>		<b>HAND AUGER BORING LOG: HA-5</b>		
DATE STARTED: <b>10/22/20</b>		DATE FINISHED: <b>10/22/20</b>		NOTES: Elevation Unknown		
SAMPLING METHOD: <b>Hand Auger</b>		PERFORMED BY: <b>J. Prevatte</b>				
WATER LEVEL: <b>2' ATD</b>						
Depth (feet)	GRAPHIC LOG	MATERIAL DESCRIPTION	ELEVATION (feet)	WATER LEVEL	DYNAMIC CONE PENETRATION RESISTANCE (blows/1.75 in.)	DCP VALUE
		<b>TOPSOIL</b> - 8 inches.			10 20 30 60 80	3
1		<b>CLAYEY SAND (SC)</b> - Very loose, tan to orange and gray, mostly fine to medium sand, some low to medium plasticity fines, moist to wet.				3
2			▽			2
3						4
4						4
5		Boring terminated at 5 ft Target Depth				5

REFERENCE ONLY



DCP INDEX IS THE DEPTH (IN.) OF PENETRATION PER BLOW OF A 10.1 LB HAMMER FALLING 22.6 IN., DRIVING A 0.79 IN. O.D. 60 DEGREE CONE.

PROJECT:		Florence Industrial Park Florence, South Carolina 1339-20-035		HAND AUGER BORING LOG: HA-6			
DATE STARTED:		10/22/20		DATE FINISHED:		10/22/20	
SAMPLING METHOD:		Hand Auger		PERFORMED BY:		J. Prevatte	
WATER LEVEL:		2' ATD		NOTES: Elevation Unknown			
Depth (feet)	GRAPHIC LOG	MATERIAL DESCRIPTION	ELEVATION (feet)	WATER LEVEL	DYNAMIC CONE PENETRATION RESISTANCE (blows/1.75 in.)		DCP VALUE
		TOPSOIL - 10 inches.			10 20 30 60 80		3
1		CLAYEY SAND (SC) - Very loose to loose, orange and gray, mostly fine to medium sand, some low to medium plasticity fines, moist to wet.					3
2				▽			5
3							3
4							3
5		Boring terminated at 5 ft Target Depth					4

REFERENCE ONLY



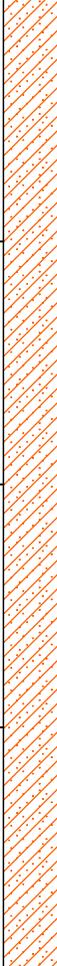
DCP INDEX IS THE DEPTH (IN.) OF PENETRATION PER BLOW OF A 10.1 LB HAMMER FALLING 22.6 IN., DRIVING A 0.79 IN. O.D. 60 DEGREE CONE.

PROJECT:		<b>Florence Industrial Park</b> <b>Florence, South Carolina</b> <b>1339-20-035</b>		<b>HAND AUGER BORING LOG: HA-7</b>		
DATE STARTED: <b>10/22/20</b>		DATE FINISHED: <b>10/22/20</b>		NOTES: Elevation Unknown		
SAMPLING METHOD: <b>Hand Auger</b>		PERFORMED BY: <b>J. Prevatte</b>				
WATER LEVEL: <b>1.5' ATD</b>						
Depth (feet)	GRAPHIC LOG	MATERIAL DESCRIPTION	ELEVATION (feet)	WATER LEVEL	DYNAMIC CONE PENETRATION RESISTANCE (blows/1.75 in.)	DCP VALUE
		<b>TOPSOIL</b> - 8 inches.			10 20 30 60 80	3
1		<b>CLAYEY SAND (SC)</b> - Very loose to loose, orange and gray, mostly fine to medium sand, some low to medium plasticity fines, wet.		▽		5
2						4
3						5
4						6
5		Boring terminated at 5 ft Target Depth				5

REFERENCE ONLY



DCP INDEX IS THE DEPTH (IN.) OF PENETRATION PER BLOW OF A 10.1 LB HAMMER FALLING 22.6 IN., DRIVING A 0.79 IN. O.D. 60 DEGREE CONE.

PROJECT:		Florence Industrial Park Florence, South Carolina 1339-20-035		HAND AUGER BORING LOG: HA-8		
DATE STARTED:		10/22/20	DATE FINISHED:		10/22/20	NOTES: Elevation Unknown
SAMPLING METHOD:		Hand Auger	PERFORMED BY:		J. Prevatte	
WATER LEVEL:		1' ATD				
Depth (feet)	GRAPHIC LOG	MATERIAL DESCRIPTION	ELEVATION (feet)	WATER LEVEL	DYNAMIC CONE PENETRATION RESISTANCE (blows/1.75 in.)	DCP VALUE
0		WOOD CHIPS - 12 inches.			10 20 30 60 80	2
1		CLAYEY SAND (SC) - Very loose to loose, brown to orange and gray, mostly fine to medium sand, some low to medium plasticity fines, moist to wet.				10
2						3
3						4
4						5
5		Boring terminated at 5 ft Target Depth				5

REFERENCE ONLY



DCP INDEX IS THE DEPTH (IN.) OF PENETRATION PER BLOW OF A 10.1 LB HAMMER FALLING 22.6 IN., DRIVING A 0.79 IN. O.D. 60 DEGREE CONE.

PROJECT:		Florence Industrial Park Florence, South Carolina 1339-20-035		HAND AUGER BORING LOG: HA-9		
DATE STARTED: 10/22/20		DATE FINISHED: 10/22/20		NOTES: Elevation Unknown		
SAMPLING METHOD: Hand Auger		PERFORMED BY: J. Prevatte				
WATER LEVEL: 1.5' ATD						
Depth (feet)	GRAPHIC LOG	MATERIAL DESCRIPTION	ELEVATION (feet)	WATER LEVEL	DYNAMIC CONE PENETRATION RESISTANCE (blows/1.75 in.)	DCP VALUE
		TOPSOIL - 6 inches.			10 20 30 60 80	2
1		CLAYEY SAND (SC) - Very loose to loose, brown to orange and gray, mostly fine to medium sand, some low to medium plasticity fines, moist to wet.		▽		5
2						4
3						5
4						4
5			Boring terminated at 5 ft Target Depth			

REFERENCE ONLY



DCP INDEX IS THE DEPTH (IN.) OF PENETRATION PER BLOW OF A 10.1 LB HAMMER FALLING 22.6 IN., DRIVING A 0.79 IN. O.D. 60 DEGREE CONE.

PROJECT:		<b>Florence Industrial Park</b> <b>Florence, South Carolina</b> <b>1339-20-035</b>		<b>HAND AUGER BORING LOG: HA-10</b>		
DATE STARTED: <b>10/22/20</b>		DATE FINISHED: <b>10/22/20</b>		NOTES: Elevation Unknown		
SAMPLING METHOD: <b>Hand Auger</b>		PERFORMED BY: <b>J. Prevatte</b>				
WATER LEVEL: <b>1.5' ATD</b>						
Depth (feet)	GRAPHIC LOG	MATERIAL DESCRIPTION	ELEVATION (feet)	WATER LEVEL	DYNAMIC CONE PENETRATION RESISTANCE (blows/1.75 in.)	DCP VALUE
		<b>TOPSOIL</b> - 8 inches.			10 20 30 60 80	2
1		<b>CLAYEY SAND (SC)</b> - Very loose, brown to orange and gray, mostly fine to medium sand, some low to medium plasticity fines, wet.		▽		3
2						4
3						3
4						4
5		Boring terminated at 5 ft Target Depth				4

REFERENCE ONLY



DCP INDEX IS THE DEPTH (IN.) OF PENETRATION PER BLOW OF A 10.1 LB HAMMER FALLING 22.6 IN., DRIVING A 0.79 IN. O.D. 60 DEGREE CONE.

**Appendix III – Laboratory Data**

**REFERENCE ONLY**

## ❖ Summary of Laboratory Testing Procedures

### Examination of Recovered Soil Samples

Soil and field records were reviewed in the laboratory by the geotechnical professional. Soils were classified in general accordance with the visual-manual method described in ASTM D 2488, *"Standard Practice for Description and Identification of Soils (Visual-Manual Method)"*.

Representative soil samples were selected for classification testing to provide grain size and plasticity data to allow classification of the samples in general accordance with the Unified Soil Classification System method described in ASTM D 2487, *"Standard Practice for Classification of Soils for Engineering Purposes"*. The geotechnical professional also prepared the final boring and sounding records enclosed with this report.

### Moisture Content Testing of Soil Samples by Oven Drying

Moisture content was determined in general conformance with the methods outlined in ASTM D 2216, *"Standard Test Method for Laboratory Determination of Water (Moisture) Content of Soil or Rock by Mass."* This method is limited in scope to Group B, C, or D samples of earth materials which do not contain appreciable amounts of organic material, soluble solids such as salt or reactive solids such as cement. This method is also limited to samples which do not contain contamination.

A representative portion of the soil was divided from the sample using one of the methods described in Section 9 of ASTM D 2216. The split portion was then placed in a drying oven and heated to approximately 110 degrees C overnight or until a constant mass was achieved after repetitive weighing. The moisture content of the soil was then computed as the mass of water removed from the sample by drying, divided by the mass of the sample dry, times 100 percent. No attempt was made to exclude any particular particle size from the portion split from the sample.

### Percent Fines Determination of Samples

A selected specimen of soils was washed over a No. 200 sieve after being thoroughly mixed and dried. This test was conducted in general accordance with ASTM D 1140, *"Standard Test Method for Amount of Material Finer Than the No. 200 Sieve."* Method A, using water to wash the sample through the sieve without soaking the sample for a prescribed period of time, was used and the percentage by weight of material washing through the sieve was deemed the "percent fines" or percent clay and silt fraction.

### Liquid and Plastic Limits Testing

Atterberg limits of the soils was determined generally following the methods described by ASTM D 4318, *"Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils."* Albert Atterberg originally defined "limits of consistency" of fine grained soils in terms of their relative ease of deformation at various moisture contents. In current engineering usage, the liquid limit of a soil is defined as the moisture content, in percent, marking the upper limit of viscous flow and the boundary with a semi-liquid state. The plastic limit defines the lower limit of plastic behavior, above which a soil behaves plastically below which it retains its shape upon drying. The plasticity

## ***Summary of Laboratory Testing Procedures - Continued***

index (PI) is the range of water content over which a soil behaves plastically. Numerically, the PI is the difference between liquid limit and plastic limit values.

Representative portions of fine grained Group A, B, C, or D samples were prepared using the wet method described in Section 10.1 of ASTM D 4318. The liquid limit of each sample was determined using the multipoint method (Method A) described in Section 11. The liquid limit is by definition the moisture content where 25 drops of a hand operated liquid limit device are required to close a standard width groove cut in a soil sample placed in the device. After each test, the moisture content of the sample was adjusted and the sample replaced in the device. The test was repeated to provide a minimum of three widely spaced combinations of N versus moisture content. When plotted on semi-log paper, the liquid limit moisture content was determined by straight line interpolation between the data points at N equals 25 blows.

The plastic limit was determined using the procedure described in Section 17 of ASTM D 4318. A selected portion of the soil used in the liquid limit test was kneaded and rolled by hand until it could no longer be rolled to a 3.2 mm thread on a glass plate. This procedure was repeated until at least 6 grams of material was accumulated, at which point the moisture content was determined using the methods described in ASTM D 2216.

### **Compaction Tests of Soils Using Modified Effort**

Soil placed as engineering fill is compacted to a dense state to obtain satisfactory engineering properties. Laboratory compaction tests provide the basis for determining the percent compaction and water content needed to achieve the required engineering properties, and for controlling construction to assure the required compaction and water contents are achieved. Test procedures generally followed those described by ASTM D 1557, "Standard Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 lbf/ft<sup>3</sup>)."

The relationship between water content and the dry unit weight is determined for soils compacted in a 4 inch diameter molds with a 10 lb rammer dropped from a height of 18 inches, producing a compactive effort of 56,000 lbf/ft<sup>3</sup>.

Soil was compacted in the mold in five layers of approximately equal thickness, each compacted with 25 blows of the rammer. After compaction of the sample in the mold, the resulting dry density and moisture content was determined and the procedure repeated. Separate soils were used for each sample point, adjusting the moisture content of the soil as described in Section 10.2 (Moist Preparation Method). The procedure was repeated for a sufficient number of water content values to allow the dry density vs. water content values to be plotted and the maximum dry density and optimum moisture content to be determined from the resulting curvilinear relationship.

### **Laboratory California Bearing Ratio Tests of Compacted Samples**

This method is used to evaluate the potential strength of subgrade, subbase, and base course material, including recycled materials, for use in road and airfield pavements. Laboratory CBR tests were run in general accordance with the procedures laid out in ASTM D 1883, "Standard Test Method for CBR (California Bearing Ratio) of Laboratory Compacted Soils." Specimens were prepared in standard molds using two different levels of compactive effort within plus or minus 0.5 percent of the optimum moisture content value. While embedded in the compaction mold,

### ***Summary of Laboratory Testing Procedures - Continued***

each sample was inundated for a minimum period of 96 hours to achieve saturation. During inundation the specimen was surcharged by a weight approximating the anticipated weight of the pavement and base course layers. After removing the sample from the soaking bath, the soil was then sheared by jacking a piston having a cross sectional area of 3 square inches into the end surface of the specimen. The piston was jacked 0.5 inches into the specimen at a constant rate of 0.05 inches per minute.

The CBR is defined as the load required to penetrate a material to a predetermined depth, compared to the load required to penetrate a standard sample of crushed stone to the same depth. The CBR value was usually based on the load ratio for a penetration of 0.10 inches, after correcting the load-deflection curves for surface irregularities or upward concavity. However, where the calculated CBR for a penetration of 0.20 inches was greater than the result obtained for a penetration of 0.10 inches, the test was repeated by reversing the specimen and shearing the opposite end surface. Where the second test indicated a greater CBR at 0.20 inches penetration, the CBR for 0.20 inches penetration was used.

**REFERENCE ONLY**





## LIQUID LIMIT, PLASTIC LIMIT, & PLASTIC INDEX



ASTM D 4318  AASHTO T 89  AASHTO T 90

S&ME, Inc. - Florence: 2327 Prosperity Way, Suite 9, Florence, SC 29501

Project #:	1339-20-035	Report Date:	11/12/2020
Project Name:	Florence Industrial Park	Test Date(s)	11/11/2020
Client Name:	Thomas & Hutton		
Client Address:	1501 Main Street, Ste. 760; Columbia, South Carolina 29201		
Boring #:	C-2	Sample #:	S-1
		Sample Date:	10/22/2020
Location:	Pavement Areas		Depth : 0.5 to 2 ft

Sample Description: Brown Clayey Sand (SC)					
Type and Specification	S&ME ID #	Cal Date:	Type and Specification	S&ME ID #	Cal Date:
Balance (0.01 g)	24496	11/14/2019	Grooving tool	34452	9/9/2019
LL Apparatus	34453	9/9/2019			
Oven	24457	11/14/2019			

Pan #	Tare #:	Liquid Limit					Plastic Limit		
		51	54	00			155	10	
A	Tare Weight	15.07	14.98	19.47			13.65	13.75	
B	Wet Soil Weight + A	25.93	24.01	29.40			20.14	21.09	
C	Dry Soil Weight + A	23.87	22.28	27.37			19.24	20.08	
D	Water Weight (B-C)	2.06	1.73	2.03			0.90	1.01	
E	Dry Soil Weight (C-A)	8.80	7.30	7.90			5.59	6.33	
F	% Moisture (D/E)*100	23.4%	23.7%	25.7%			16.1%	16.0%	
N	# OF DROPS	34	28	16			<i>Moisture Contents determined by ASTM D 2216</i>		
LL	LL = F * FACTOR								
Ave.	Average						<b>16.1%</b>		



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	<input type="checkbox"/>
Liquid Limit	<b>24</b>
Plastic Limit	<b>16</b>
Plastic Index	<b>8</b>
Group Symbol	<b>SC</b>

Multipoint Method   
 One-point Method

Wet Preparation  Dry Preparation  Air Dried  Estimate the % Retained on the #40 Sieve: 10%

Notes / Deviations / References:

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

W. Kannon  
Technician Name

11/12/2020  
Date

W. Kannon  
Technical Responsibility

11/12/2020  
Date

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# LIQUID LIMIT, PLASTIC LIMIT, & PLASTIC INDEX



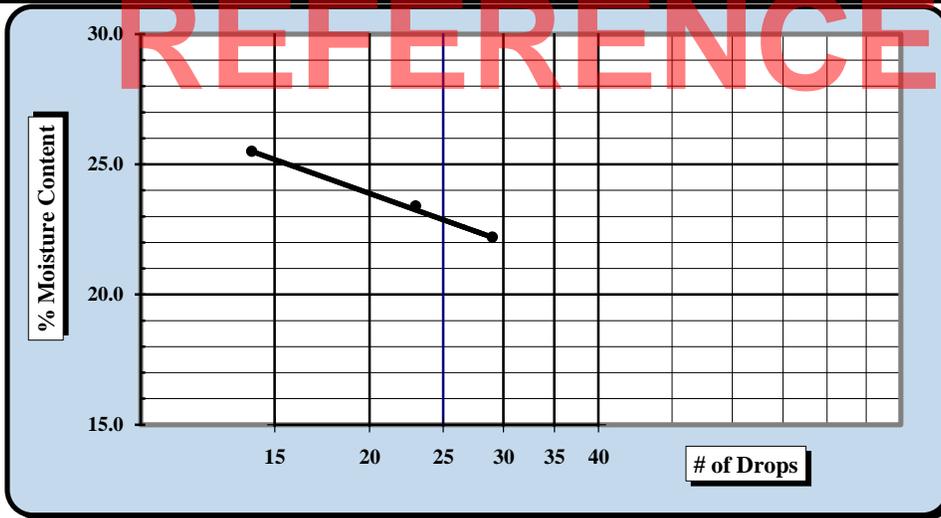
ASTM D 4318  AASHTO T 89  AASHTO T 90

S&ME, Inc. - Florence: 2327 Prosperity Way, Suite 9, Florence, SC 29501

Project #:	1339-20-035	Report Date:	11/12/2020
Project Name:	Florence Industrial Park	Test Date(s)	11/11/2020
Client Name:	Thomas & Hutton		
Client Address:	1501 Main Street, Ste. 760; Columbia, South Carolina 29201		
Boring #:	C-6	Sample #:	S-1
		Sample Date:	10/22/20
Location:	Pavement Areas		Depth : 0.5 to 2 ft

Sample Description: Brown and Gray Clayey Sand (SC)					
Type and Specification	S&ME ID #	Cal Date:	Type and Specification	S&ME ID #	Cal Date:
Balance (0.01 g)	24496	11/14/2019	Grooving tool	34452	9/9/2019
LL Apparatus	34453	9/9/2019			
Oven	24457	11/14/2019			

Pan #	Tare #:	Liquid Limit					Plastic Limit		
		11	131	10A			14	55	
A	Tare Weight	13.82	13.83	13.84			13.87	15.44	
B	Wet Soil Weight + A	24.99	25.80	23.94			22.51	20.84	
C	Dry Soil Weight + A	22.96	23.53	21.89			21.38	20.15	
D	Water Weight (B-C)	2.03	2.27	2.05			1.13	0.69	
E	Dry Soil Weight (C-A)	9.14	9.70	8.05			7.51	4.71	
F	% Moisture (D/E)*100	22.2%	23.4%	25.5%			15.0%	14.6%	
N	# OF DROPS	29	23	14			Moisture Contents determined by ASTM D 2216		
LL	LL = F * FACTOR						<b>14.8%</b>		
Ave.	Average								



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	<input type="checkbox"/>
Liquid Limit	<b>23</b>
Plastic Limit	<b>15</b>
Plastic Index	<b>8</b>
Group Symbol	<b>SC</b>

Multipoint Method   
One-point Method

Wet Preparation  Dry Preparation  Air Dried  Estimate the % Retained on the #40 Sieve: 10%

Notes / Deviations / References:

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

W. Kannon  
Technician Name

11/12/2020  
Date

W. Kannon  
Technical Responsibility

11/12/2020  
Date

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## LIQUID LIMIT, PLASTIC LIMIT, & PLASTIC INDEX



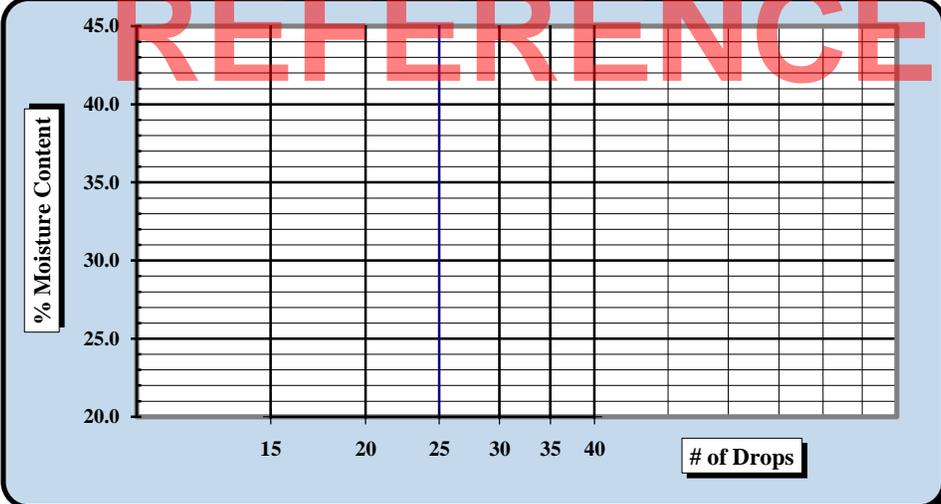
ASTM D 4318  AASHTO T 89  AASHTO T 90

S&ME, Inc. - Florence: 2327 Prosperity Way, Suite 9, Florence, SC 29501

Project #:	1339-20-035	Report Date:	11/12/2020
Project Name:	Florence Industrial Park	Test Date(s)	11/11/2020
Client Name:	Thomas & Hutton		
Client Address:	1501 Main Street, Ste. 760; Columbia, South Carolina 29201		
Boring #:	C-9	Sample #:	S-1
		Sample Date:	10/22/20
Location:	Pavement Areas		Depth : 8" - 1.5'

Sample Description: Brown and Tan Silty Sand (SM)					
Type and Specification	S&ME ID #	Cal Date:	Type and Specification	S&ME ID #	Cal Date:
Balance (0.01 g)	24496	11/14/2019	Grooving tool	34452	9/9/2019
LL Apparatus	34453	9/9/2019			
Oven	24457	11/14/2019			

Pan #	Tare #:	Liquid Limit				Plastic Limit			
A	Tare Weight								
B	Wet Soil Weight + A								
C	Dry Soil Weight + A								
D	Water Weight (B-C)								
E	Dry Soil Weight (C-A)								
F	% Moisture (D/E)*100								
N	# OF DROPS								Moisture Contents determined by ASTM D 2216
LL	LL = F * FACTOR								
Ave.	Average								



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	<input checked="" type="checkbox"/>
Liquid Limit	[ ]
Plastic Limit	<b>NP</b>
Plastic Index	[ ]
Group Symbol	<b>SM</b>

Wet Preparation  Dry Preparation  Air Dried  Estimate the % Retained on the #40 Sieve: 10%

Notes / Deviations / References:

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

W. Kannon <small>Technician Name</small>	11/12/2020 <small>Date</small>	W. Kannon <small>Technical Responsibility</small>	11/12/2020 <small>Date</small>
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## LIQUID LIMIT, PLASTIC LIMIT, & PLASTIC INDEX



ASTM D 4318  AASHTO T 89  AASHTO T 90

S&ME, Inc. - Florence: 2327 Prosperity Way, Suite 9, Florence, SC 29501

Project #:	1339-20-035	Report Date:	11/12/2020
Project Name:	Florence Industrial Park	Test Date(s)	11/11/2020
Client Name:	Thomas & Hutton		
Client Address:	1501 Main Street, Ste. 760; Columbia, South Carolina 29201		
Boring #:	HA-9	Sample #:	S-3
		Sample Date:	10/22/20
Location:	Pavement Areas		Depth : 3' - 4'

Sample Description: Orange and Gray Clayey Sand (SC)					
Type and Specification	S&ME ID #	Cal Date:	Type and Specification	S&ME ID #	Cal Date:
Balance (0.01 g)	24496	11/14/2019	Grooving tool	34452	9/9/2019
LL Apparatus	34453	9/9/2019			
Oven	24457	11/14/2019			

Pan #	Tare #:	Liquid Limit					Plastic Limit		
		50	52	53			14	55	
A	Tare Weight	15.14	15.34	14.94			13.83	13.79	
B	Wet Soil Weight + A	24.67	24.89	24.21			19.71	18.80	
C	Dry Soil Weight + A	22.41	22.47	21.57			18.97	18.19	
D	Water Weight (B-C)	2.26	2.42	2.64			0.74	0.61	
E	Dry Soil Weight (C-A)	7.27	7.13	6.63			5.14	4.40	
F	% Moisture (D/E)*100	31.1%	33.9%	39.8%			14.4%	13.9%	
N	# OF DROPS	29	23	14			Moisture Contents determined by ASTM D 2216		
LL	LL = F * FACTOR								
Ave.	Average						<b>14.2%</b>		



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	<input type="checkbox"/>
Liquid Limit	<b>33</b>
Plastic Limit	<b>14</b>
Plastic Index	<b>19</b>
Group Symbol	<b>SC</b>

Multipoint Method   
 One-point Method

Wet Preparation  Dry Preparation  Air Dried  Estimate the % Retained on the #40 Sieve: 10%

Notes / Deviations / References:

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

W. Kannon  
Technician Name

11/12/2020  
Date

W. Kannon  
Technical Responsibility

11/12/2020  
Date

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## LIQUID LIMIT, PLASTIC LIMIT, & PLASTIC INDEX



ASTM D 4318  AASHTO T 89  AASHTO T 90

S&ME, Inc. - Florence: 2327 Prosperity Way, Suite 9, Florence, SC 29501

Project #:	1339-20-035	Report Date:	10-24-20
Project Name:	Florence Industrial Park	Test Date(s)	10-19-20
Client Name:	Thomas & Hutton		
Client Address:	1501 Main Street, Ste. 760; Columbia, South Carolina 29201		
Boring #:	HA-1	Sample #:	Bulk-1
		Sample Date:	10-14-20
Location:	Pavement Areas		Depth : 0.5 to 2 ft

Sample Description: Brown Clayey Sand (SC)					
Type and Specification	S&ME ID #	Cal Date:	Type and Specification	S&ME ID #	Cal Date:
Balance (0.01 g)	24496	11/14/2019	Grooving tool	34452	9/9/2019
LL Apparatus	34453	9/9/2019			
Oven	24457	11/14/2019			

Pan #	Tare #:	Liquid Limit					Plastic Limit	
		10	155	50			8	53
A	Tare Weight	13.72	13.62	15.16			13.84	14.93
B	Wet Soil Weight + A	21.25	21.63	24.66			18.02	18.43
C	Dry Soil Weight + A	19.68	19.98	22.75			17.51	17.96
D	Water Weight (B-C)	1.57	1.65	1.91			0.51	0.47
E	Dry Soil Weight (C-A)	5.96	6.36	7.59			3.67	3.03
F	% Moisture (D/E)*100	26.3%	25.9%	25.2%			13.9%	15.5%
N	# OF DROPS	20	25	33			Moisture Contents determined by ASTM D 2216	
LL	LL = F * FACTOR							
Ave.	Average						<b>14.7%</b>	



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	<input type="checkbox"/>
Liquid Limit	<b>26</b>
Plastic Limit	<b>15</b>
Plastic Index	<b>11</b>
Group Symbol	<b>SC</b>

Multipoint Method   
 One-point Method

Wet Preparation  Dry Preparation  Air Dried  Estimate the % Retained on the #40 Sieve: 10%

Notes / Deviations / References:

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

Jason Colvin  
 Technician Name

9/3/2018  
 Date

Technical Responsibility

Date

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# LIQUID LIMIT, PLASTIC LIMIT, & PLASTIC INDEX



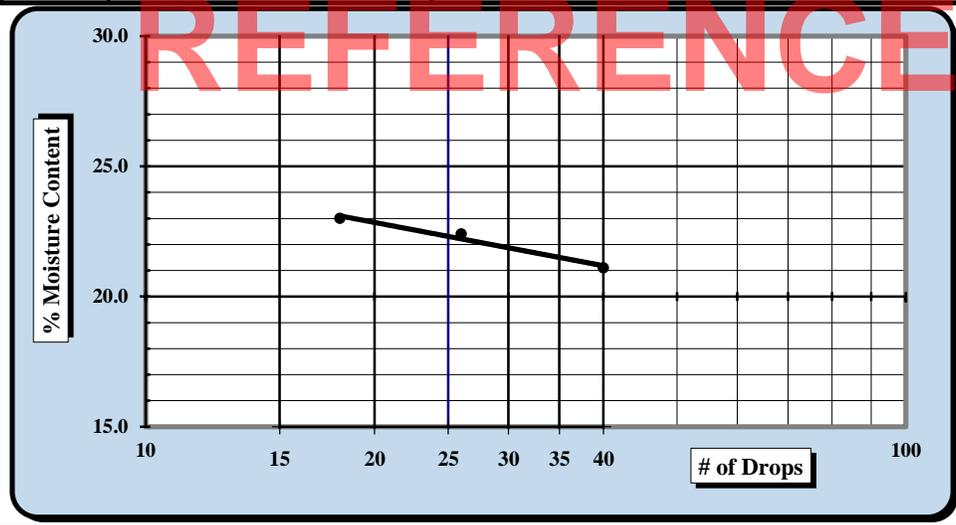
ASTM D 4318  AASHTO T 89  AASHTO T 90

S&ME, Inc. - Myrtle Beach: 1330 Highway 501 Business, Conway, SC 29526

Project #:	1339-20-035	Report Date:	11/5/2020
Project Name:	Florence Industrial Park	Test Date(s)	11/5/2020
Client Name:	Thomas & Hutton		
Client Address:	1501 Main Street, Ste. 760; Columbia, South Carolina 29201		
Boring #:	HA-7	Sample #:	BULK 2
		Sample Date:	10/22/2020
Location:	Pavement Areas		Depth (ft): 0.5 - 2

Sample Description: Brown, Orange, and Gray Clayey Sand (SC)					
Type and Specification	S&ME ID #	Cal Date:	Type and Specification	S&ME ID #	Cal Date:
Balance (0.01 g)	00401	2/28/2020	Grooving tool	11368	9/1/2020
LL Apparatus	18801	9/1/2020			
Oven	17745	4/8/2020			

Pan #	Tare #:	Liquid Limit					Plastic Limit		
		50	52	52			8	9	
A	Tare Weight	15.16	15.35	14.93			13.83	13.77	
B	Wet Soil Weight + A	24.41	24.85	25.74			20.39	19.87	
C	Dry Soil Weight + A	22.80	23.11	23.72			19.60	19.14	
D	Water Weight (B-C)	1.61	1.74	2.02			0.79	0.73	
E	Dry Soil Weight (C-A)	7.64	7.76	8.79			5.77	5.37	
F	% Moisture (D/E)*100	21.1%	22.4%	23.0%			13.7%	13.6%	
N	# OF DROPS	40	26	18			Moisture Contents determined by ASTM D 2216		
LL	LL = F * FACTOR								
Ave.	Average						<b>13.7%</b>		



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	<input type="checkbox"/>
Liquid Limit	<b>22</b>
Plastic Limit	<b>14</b>
Plastic Index	<b>8</b>
Group Symbol	<b>SC</b>
Multipoint Method	<input checked="" type="checkbox"/>
One-point Method	<input type="checkbox"/>

Wet Preparation  Dry Preparation  Air Dried

Notes / Deviations / References:

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

<u>W. Kannon, P.E.</u> Technical Responsibility	<i>William Kannon</i> Signature	Project Engineer Position	11/5/2020 Date
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# MOISTURE - DENSITY REPORT

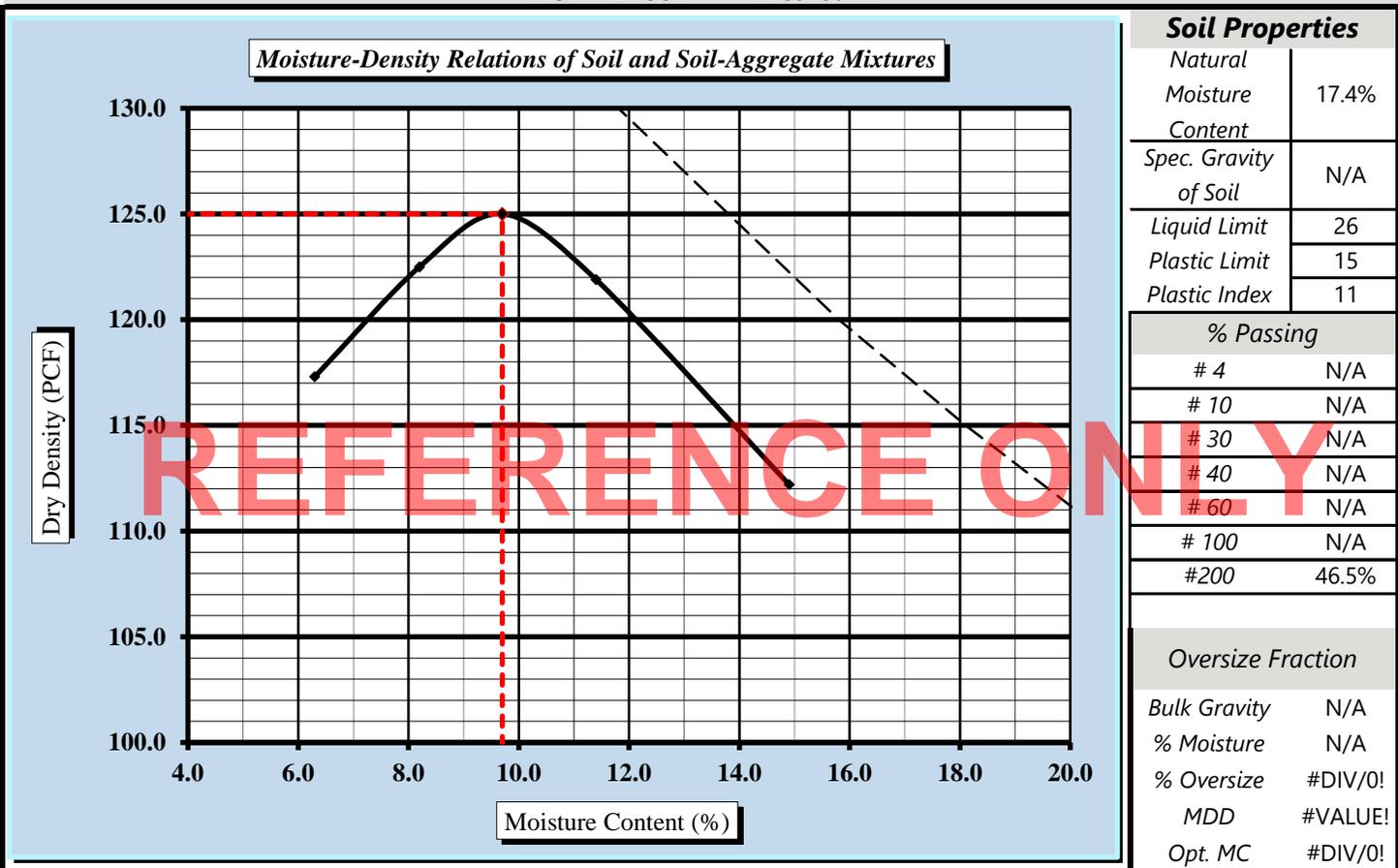


Quality Assurance

S&ME, Inc. - Florence: 2327 Prosperity Way, Suite 9, Florence, SC 29501			
S&ME Project #:	1339-20-035	Report Date:	10-19-20
Project Name:	Florence Industrial Park	Test Date(s):	10-15-20
Client Name:	Thomas & Hutton		
Client Address:	1501 Main Street, Ste. 760; Columbia, South Carolina		
Boring #:	HA-1	Sample #:	Bulk-1
		Sample Date:	10/14/2020
Location:	Pavement Areas	Depth:	0.5 to 2 ft
Sample Description:	Brown and Orange Clayey Sand (SC)		

Maximum Dry Density	125.0	PCF.	Optimum Moisture Content	9.7%
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**ASTM D1557 - - Method A**



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:

<u>Jason Colvin</u> Technical Responsibility	<u>Jason Colvin</u> Signature	<u>Laboratory Manager</u> Position	<u>10-19-20</u> Date
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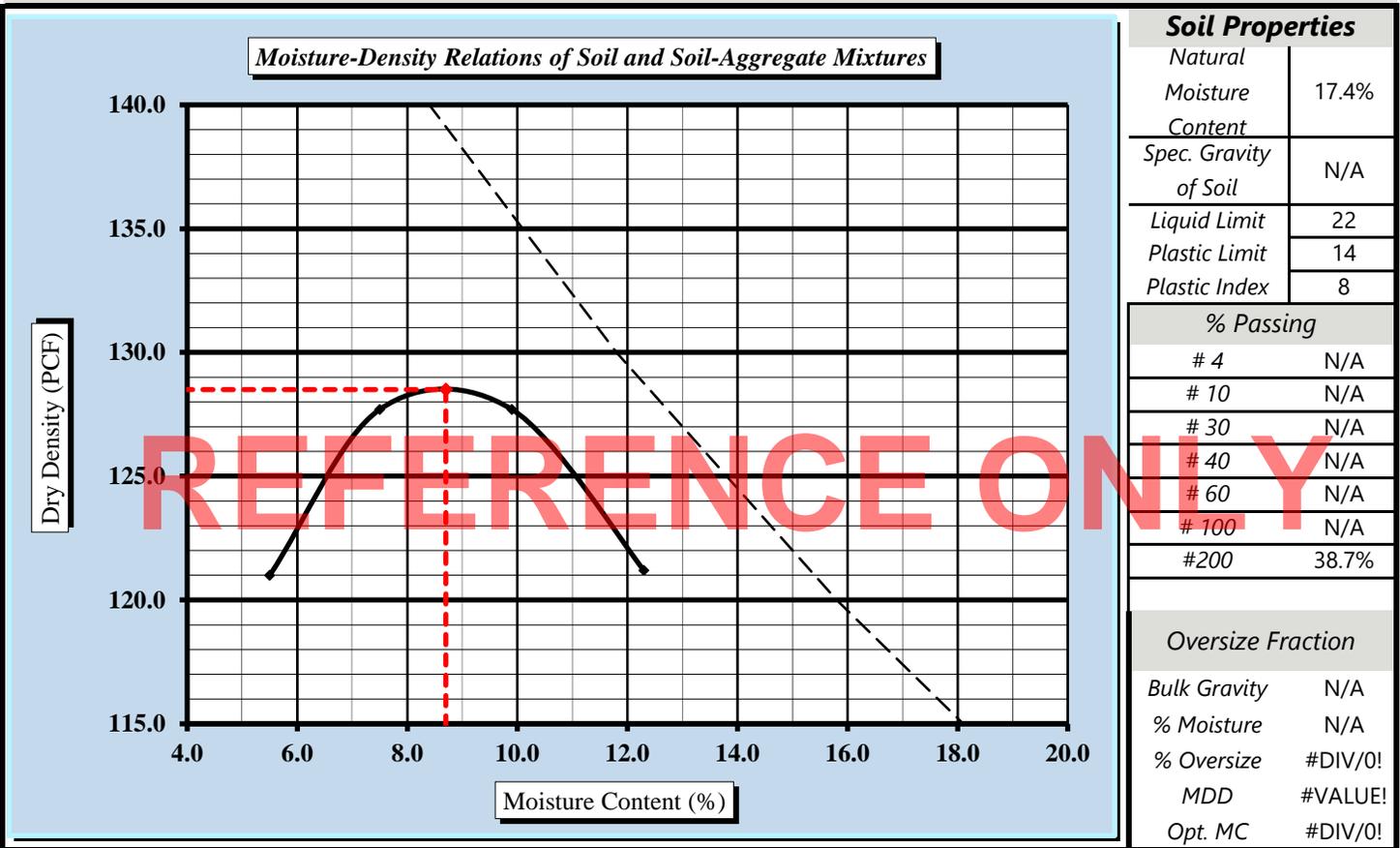


Quality Assurance

S&ME, Inc. - Florence: 2327 Prosperity Way, Suite 9, Florence, SC 29501			
S&ME Project #:	1339-20-035	Report Date:	11/9/2020
Project Name:	Florence Industrial Park	Test Date(s):	11/2/2002
Client Name:	Thomas & Hutton		
Client Address:	1501 Main Street, Ste. 760; Columbia, South Carolina		
Boring #:	HA-7	Sample #:	Bulk-2
		Sample Date:	10/22/2020
Location:	Pavement Areas	Depth:	0.5 to 2 ft
Sample Description:	Tan/Gray Clayey Sand (SC)		

Maximum Dry Density	128.5	PCF.	Optimum Moisture Content	8.7%
---------------------	-------	------	--------------------------	------

**ASTM D1557 - - Method A**



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

References / Comments / Deviations:

<u>Jason Colvin</u> Technical Responsibility	<i>Jason Colvin</i> Signature	<u>Laboratory Manager</u> Position	<u>11/9/2020</u> Date
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## CBR (CALIFORNIA BEARING RATIO) OF LABORATORY COMPACTED SOIL



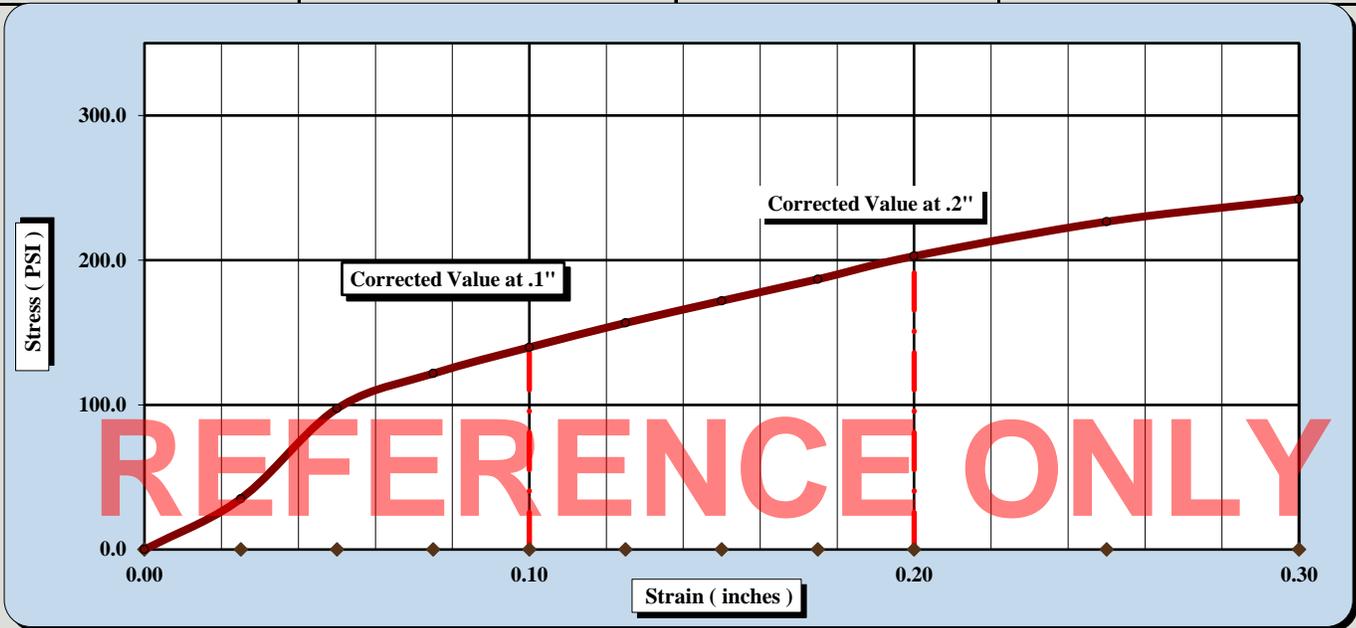
ASTM D 1883

S&ME, Inc. - Florence: 2327 Prosperity Way, Suite 9, Florence, SC 29501

Project #:	1339-20-035	Report Date:	10-24-20
Project Name:	Florence Industrial Park	Test Date(s)	
Client Name:	Thomas & Hutton		
Client Address:	1501 Main Street, Ste. 760; Columbia, South Carolina 29201		
Boring #:	HA-1	Sample #:	Bulk-1
		Sample Date:	10-14-20
Location:	Pavement Areas	Depth:	0.5 to 2 ft
Sample Description:	Brown Clayey Sand (SC)		

ASTM D1557 Method A      Maximum Dry Density: 125.0 PCF      Optimum Moisture Content: 9.7%  
 Compaction Test performed on the Fine Fraction only      % Retained on the 3/4" sieve: 0.0%

Uncorrected CBR Values		Corrected CBR Values	
CBR at 0.1 in.	14.0	CBR at 0.2 in.	13.5
		CBR at 0.1 in.	14.0
		CBR at 0.2 in.	13.5



CBR Sample Preparation: *Performed on the fine fraction*  
*The entire gradation was used and compacted in a 6" CBR mold in accordance with*

Before Soaking		After Soaking	
Compactive Effort (Blows per Layer)	30		
Initial Dry Density (PCF)	116.9	Final Dry Density (PCF)	116.2
Moisture Content of the Compacted Specimen	9.6%	Moisture Content (top 1" after soaking)	16.6%
Percent Compaction	93.6%	Percent Swell	0.7%

Soak Time:	96 hrs	Surcharge Weight	10.0	Surcharge Wt. per sq. Ft.	51.1
Liquid Limit	26	Plastic Index	11	Apparent Relative Density	N/A

Notes/Deviations/References:

Jason Colvin  
 Technical Responsibility

\_\_\_\_\_  
 Signature

Laboratory Manager  
 Position

10-24-20  
 Date

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## CBR (CALIFORNIA BEARING RATIO) OF LABORATORY COMPACTED SOIL



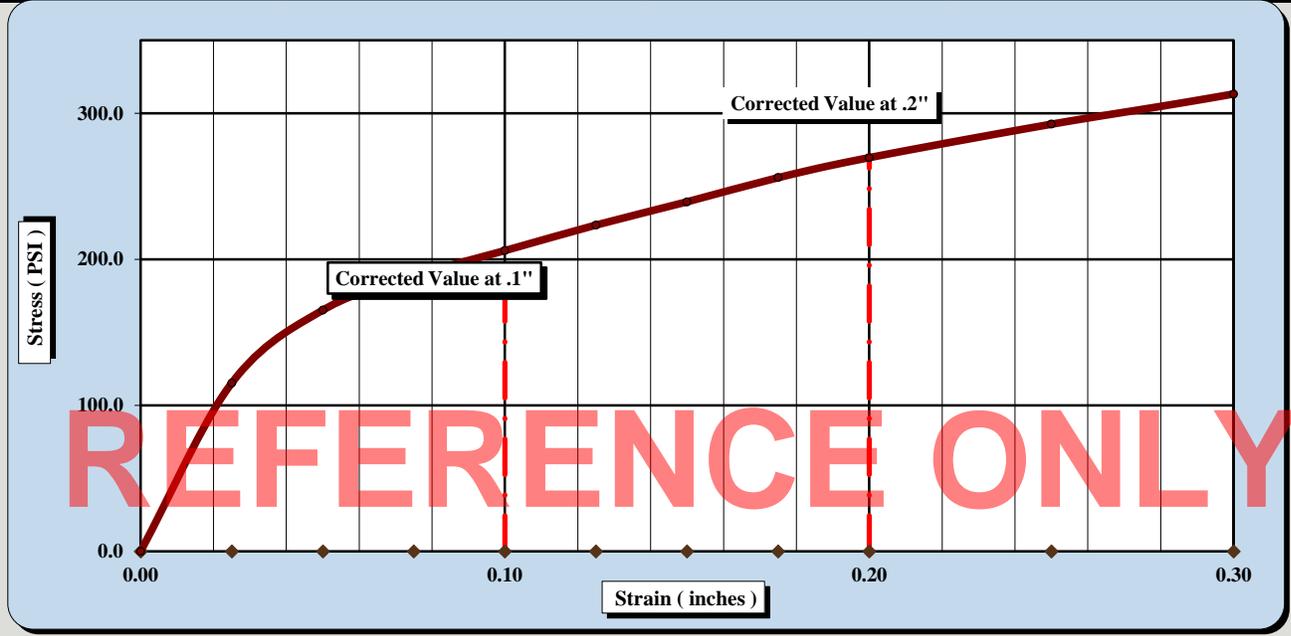
ASTM D 1883

S&ME, Inc. - Florence: 2327 Prosperity Way, Suite 9, Florence, SC 29501

Project #:	1339-20-035	Report Date:	11/9/2020
Project Name:	Florence Industrial Park	Test Date(s)	11/2/2002
Client Name:	Thomas & Hutton		
Client Address:	1501 Main Street, Ste. 760; Columbia, South Carolina 29201		
Boring #:	HA-7	Sample #:	Bulk-2
		Sample Date:	10/22/2020
Location:	Pavement Areas	Depth:	0.5 to 2 ft
Sample Description:	Gray/Tan Clayey Sand (SC)		

ASTM D1557 Method A	Maximum Dry Density: 128.5 PCF	Optimum Moisture Content: 8.7%	
	Compaction Test performed on the Fine Fraction only	% Retained on the 3/4" sieve: 0.0%	

Uncorrected CBR Values		Corrected CBR Values	
CBR at 0.1 in.	20.6	CBR at 0.1 in.	20.6
	18.0		18.0



CBR Sample Preparation: *Performed on the fine fraction*  
*The entire gradation was used and compacted in a 6" CBR mold in accordance with*

Before Soaking		After Soaking	
Compactive Effort (Blows per Layer)	27	Final Dry Density (PCF)	121.4
Initial Dry Density (PCF)	122.0	Moisture Content (top 1" after soaking)	12.4%
Moisture Content of the Compacted Specimen	8.5%	Percent Swell	0.4%
Percent Compaction	94.9%		

Soak Time: 96 hrs	Surcharge Weight: 10.0	Surcharge Wt. per sq. Ft.: 51.0	
Liquid Limit: 26	Plastic Index: 11	Apparent Relative Density: N/A	

Notes/Deviations/References:

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Jason Colvin  
 Technical Responsibility

\_\_\_\_\_  
 Signature

Laboratory Manager  
 Position

11/9/2020  
 Date

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December 17, 2020

Thomas & Hutton  
1501 Main Street, Suite 760  
Columbia, South Carolina 29201

Attention: Mr. Ross Oakley, P.E.

Reference: **Report of Supplemental Geotechnical Exploration  
Florence Industrial Park**  
Florence, South Carolina  
S&ME Project No. 1339-20-035

Dear Mr. Oakley:

S&ME, Inc. has completed the subsurface exploration for the referenced project after receiving authorization to proceed from you on November 18, 2020. Our exploration was conducted in general accordance with our Change to Scope and Fee for Supplemental Geotechnical Exploration, CO-001, dated November 17, 2020. This report presents the findings of our exploration, along with our conclusions and recommendations for site preparation, subgrade stabilization, pavement section thickness, and construction of the proposed pavements.

### ◆ Project Information

Project information was provided during a telephone conversation between Ross Oakley, P.E. (Thomas & Hutton) and Ron Forest, Jr., P.E. (S&ME, Inc.) on November 13, 2020. During that conversation, Mr. Oakley requested that we provide a proposal to perform additional exploration within the future left turn lane in the median of U.S. Highway 76 and the future right turn lane on the north side of U.S. Highway 76. In email correspondence on that same date, Mr. Oakley provided a site sketch with the locations of the turn lanes delineated, and requested that we perform two hand auger borings within each of the turn lane areas, for a total of four borings. The project site is located along U.S. Highway 76 in Florence, South Carolina just southwest of its intersection with Deep Woods Lane. A *Site Vicinity Map* is included in Appendix I as Figure 1. Traffic loading information has not been provided by the client.

### Traffic Loading

We were not provided with information relating to proposed traffic loading, vehicle types, or frequency at the time of this report, therefore, we made what we believe to be reasonable assumptions about the traffic loads and estimated the available traffic carrying capacity for example pavement sections. Our assumptions may or may not represent the actual traffic loading or vehicle volumes experienced by the pavement during its service life. If the anticipated average daily traffic (ADT), truck percentages, and growth rate for the proposed site pavements are known we should be provide with that information and we should be given an opportunity to reevaluate our pavement design recommendations based on the information provided.



## ◆ Exploration and Testing Procedures

### Field Exploration

Representatives of S&ME visited the site on December 7, 2020, to observe and test the soil along the planned roadway alignment at four requested test locations. Using the information provided, we performed the following tasks:

1. We performed a site walkover, observing general features of topography, existing structures, ground cover, and surface soils at the project site.
2. We established the locations of four (4) borings along the planned turn lane alignments.
3. Hand auger borings were advanced to a target depth of 5 feet below the ground surface along the proposed turn lane alignments. Dynamic cone penetrometer (DCP) testing was performed at regular depth intervals of approximately 1 foot each within the hand auger borings in general accordance with ASTM STP 399 procedures to help us estimate the relative density and consistency of the subgrade soils.
4. One 40 to 50-pound composite bulk sample of soils was obtained from the auger cuttings, and transported to our laboratory for further testing.
5. After water levels were measured in the boreholes, the borings were backfilled with soil cuttings to the existing ground surface.

A *Test Location Sketch* which illustrates approximate boring locations is attached as Figure 2 in Appendix I. A brief description of the field exploration procedures performed, as well as a soil classification legend and the soil boring logs are attached in Appendix II.

REFERENCE ONLY

### ◆ Surface Conditions

The site surface at the time of this assessment was covered with asphalt pavement in the vicinity of HA-1 and HA-2 and short to mid-length grass in the vicinity of borings HA-3 and HA-4. Test locations HA-1 and HA-2 were offset outside of the asphalt therefore the existing asphalt thickness was not obtained. Topsoil was encountered at boring locations HA-2 through HA-4 and ranged in thickness from 1 to 3 inches in thickness. Topsoil was not encountered at boring HA-1.

### ◆ Subsurface Conditions

The generalized subsurface conditions encountered within the borings performed in the explored areas are described below. For more detailed descriptions and stratifications at a test location, the respective test logs should be reviewed in Appendix II.

### Undocumented Sandy Fill

At the ground surface at boring HA-1 and beneath the topsoil at borings HA-2 through HA-4, fill soils consisting of clayey sand ("USCS Classification" SC) and silty sand (SM) were encountered to depths ranging from 2 to 2.5 feet below the ground surface in the borings. These soils were generally brown to orange, and gray in color.



Conventional DCP penetration resistances in these soils ranged from 1 blow per increment (bpi) to 10 bpi, and averaged about 4 bpi, indicating generally very loose relative density with some loose layers.

Where measured, soils within this stratum exhibited natural moisture contents ranging from 14.4 to 16.4 percent, silt and clay fines contents ranging from of 23.6 to 30.8 percent, and Atterberg limits testing of the minus #40 sieve materials indicated soils ranging from non-plastic to low plasticity with a liquid limit of 24 percent, a plastic limit of 17 percent, and a plasticity index of 7 percent measured in soils recovered from boring HA-3.

One composite bulk sample of soils collected from within this stratum was measured in the laboratory to have a modified Proctor maximum dry density of 128.4 pounds per cubic foot, at an optimum moisture content of 7.8 percent, indicating that these soils in place ranged from approximately 6.6 to 8.6 percent wet of their optimum moisture content for compaction at the time of our testing.

### **Coastal Plain Native Soil Mixtures**

Below the fill soils in the borings, Coastal Plain deposits generally consisting of silty sand (SM), clayey sand (SC), and sandy lean clay (CL) were encountered to the maximum exploration depth of 5 feet. These soils were generally tan to orange and gray in color. Conventional DCP penetration resistances in the silty and clayey sands of this stratum ranged from 3 bpi to greater than 20 bpi, and averaged about 8 bpi, indicating generally loose relative density with some medium dense layers. Conventional DCP penetration resistances in the clays of this stratum ranged from 4 bpi to 5 bpi indicating a generally soft to firm consistency.

### **Groundwater**

Groundwater was not encountered in the hand auger borings within the depths explored. Groundwater levels may fluctuate seasonally at the site, being influenced by rainfall variation and other factors. Site construction activities can also influence water elevations.

**REFERENCE ONLY**



## Summary of Laboratory Test Results

We performed laboratory testing on selected split-spoon and bulk samples to confirm the field soil classifications and assess the engineering properties of the subsurface soils, as discussed in the preceding sections of this report. The individual laboratory soil index test results are presented in Appendix III, and the results are summarized in the following table.

**Table 1: Summary of Laboratory Soil Index Testing Results**

Boring/ (Sample No.)	Sample Depth (Feet)	Natural Moisture Content (%)	Silt/Clay Fines Content (%)	Atterberg Plasticity Limits (%)			USCS Classification
				LL	PL	PI	
HA-1 to HA-4/ (Bulk)	1 – 2	14.4	23.6	--	NP	--	SM
HA-3/(S-1)	1 – 2	16.4	30.8	24	17	7	SC

\*NP = Non-plastic

**Table 2: Summary of Moisture-Density and CBR Test Results**

Boring / (Sample No.)	Modified Proctor Maximum Dry Density (pcf)	Modified Proctor Optimum Moisture Content (%)	CBR at 0.1 in. Penetration – 95% Compaction (%)
HA-1 to HA-4/(BULK)	128.4	7.8	34.3

## ◆ Conclusions and Recommendations

The conclusions and recommendations included in this section are based on the project information outlined previously and the data obtained during our supplemental geotechnical exploration. If conditions are encountered during construction that differ from those encountered at our test locations, then S&ME, Inc. should be retained to review the following recommendations based upon the new information and make any necessary changes.

Based on our exploration results and past experience with similar projects, our recommendations generally relate to subgrade preparation to improve available soil support, and construction of new pavement sections comprised of hot mix asphaltic concrete, with GABC atop properly prepared subgrade soils.



## Subgrade Preparation

Based on the findings of our exploration, we offer the following recommendations regarding stabilization of the subgrade soil conditions within the site.

1. Demolish the existing pavements at the site and remove or plug existing utilities to be abandoned prior to construction. If not removed or plugged, pipes may serve as conduits for subsurface erosion resulting in formation of voids below new pavements. Where existing utilities are left in place and plugged in the new pavement footprint, it may be necessary to undercut poorly compacted backfill to provide adequate support for new pavements.
2. Topsoil should be stripped and disposed of outside the proposed new pavement footprint.
3. Prior to grading, the site should be ditched to promote positive drainage away from the working surface. This will help reduce the potential for moisture damage to the subgrade during earthwork operations and should help to maintain stabilization of the subgrade. This should also help to remove shallow perched water.
4. In any areas that must be cut down to reach design final soil subgrade (FSG) elevation, the soil should be densified in place across the entire roadway alignment with a heavy vibratory roller at the cut grade elevation. In any areas that will require new fill to reach design final subgrade (FSG) elevation, the soil surface should be densified in place across the entire roadway alignment with a heavy vibratory roller *after* the surface has been stripped but *prior* to any new fill placement.
  - A. The exposed surfaces should be densified in place to at least 95 percent of the modified Proctor maximum dry density (ASTM D 1557) to a depth of at least 8 inches. Under favorable moisture conditions and with the proper equipment, this may be able to be accomplished by densifying the soil from the top. However, under less favorable conditions, it may be necessary for the contractor to re-work (or remove, condition, and replace) the material, using moistening or drying techniques, in order to achieve the desired level of compaction. The densification of these soils should be performed under the observation of an S&ME representative.
  - B. Based on the laboratory testing of the upper sands, we anticipate that the native soils may have a moisture content of 6 to 9 percent above optimum, indicating that significant drying may be required in the upper soils in order to properly recompact the subgrade surface. Recognize that soil moisture conditions may change between the time that we sampled these materials and when the construction is performed.
  - C. Where new fill is required, it should be imported. Re-use of the existing on-site cut soils as fill may not be feasible due to their excessive moisture content.
5. After densification of the surface, the subgrade in all areas to receive new fill (except ditches) should be proofrolled by the contractor under the observation of an S&ME representative. Proofrolling should be performed by making several passes with a fully-loaded dump truck or water truck, or similar high ground pressure equipment. The proofrolling should be conducted only during dry weather. Areas of rutting or pumping soils indicated by the proofroll may require selective undercutting or further stabilization prior to new fill placement, as advised by the Geotechnical Engineer (S&ME) at the time of construction.



- A. Where needed, based on the results of the proofroll, it may become necessary to perform undercutting and replacement of unstable soils. This should be a decision made at the time of construction based on the conditions observed.
  - B. Unsatisfactory proofroll results (unstable roadbed conditions) may require supplemental stabilization measures be performed. Stabilization of soils in place to reduce undercutting may involve the use of a bi-axial geogrid, such as Tensar BX-1200 or similar.
  - ◆ **Budget Consideration:** We recommend that you include a contingency budget and obtain contractor unit pricing for additional earthwork items to include removal and replacement of unstable soils on a per cubic yard basis, and installation of bi-axial BX-1200 geogrid on a per square yard basis, either or both of which *may be needed* in this area due to the very loose condition of the upper soils.
6. Place fill in accordance with the *Fill Placement and Compaction Requirements* section below. Once final soil subgrade (FSG) elevations are achieved and the subgrade has been properly prepared, the exposed soils should be proofrolled at FSG elevation under the observation of the Geotechnical Engineer (S&ME) immediately prior to the graded aggregate base course installation. If any areas of instability are observed during this final proofroll, further stabilization may need to be performed, as determined by the Geotechnical Engineer. After a successful proofroll, construction of the new graded aggregate base course may begin.

## Fill Placement and Compaction Requirements

Where fill soils are to be placed on this project site, the following recommendations apply:

- REFERENCE ONLY
- 1. We recommend that new fill consist of imported select fill. Imported fill soils that are used to build up the ground for pavements should meet the following minimum requirements: plasticity index of 15 percent or less; clay/silt fines content of not greater than 35 percent passing the No. 200 sieve; natural moisture content within plus or minus 2 percent of the optimum moisture content at the time of delivery.
    - A. Imported fills outside of this moisture range may need to be moisture-conditioned prior to compaction.
    - B. Fill soils should also exhibit a soaked CBR value of at least 20 percent when compacted to 95 percent of the modified Proctor maximum dry density, as measured by ASTM D 1883.
    - C. Acceptable fill materials may include soils from the following ASTM soil classifications: SC, SM, SW, SP, SW-SM, SP-SM, SW-SC, and or SP-SC. However, not all soils in these categories will comply with the plasticity and fines content requirements. Have the proposed fill soil tested for conformance to these requirements prior to importing the soil for use as fill.
  - 2. Structural fill under pavements should be compacted throughout to at least **95 percent** of the maximum dry density as defined by ASTM D1557 "*Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft<sup>3</sup> (2,700 kN-m/m<sup>3</sup>))*".

**Important:** This compaction requirement **exceeds** the minimum SCDOT soil subgrade compaction requirement of 95 percent of the standard Proctor maximum dry density as determined by SCDOT test procedure SC-T-29 that is listed in the South Carolina Department of Transportation "Standard



Specifications for Highway Construction”, 2007 edition. It is our recommendation that the modified Proctor (ASTM D 1557) compaction method should be substituted for the SCDOT compaction method (SC-T-29). Depending upon who will ultimately be responsible for these turn lanes, this substitution may need to be approved by SCDOT.

- A. Compacted soils must not exhibit pumping or rutting under equipment traffic.
- B. Loose lifts of fill should be no more than 10 inches in thickness prior to compaction (limited to 4 inches if using small, hand-operated equipment such as a walk-behind vibrating plate tamp or pneumatic “jumping jack” tamp).
3. Fill placement should be observed by an S&ME soils testing technician working under the guidance of the Geotechnical Engineer. At least one field density test should be performed per each 250 linear feet for each lift of soil along the roadway alignment, with a minimum of 2 tests per lift.

## Pavement Section Design and Construction

Site pavements will consist of flexible pavements using Hot-Mixed Asphalt (HMA).

Based upon the assumption that the pavement support soils consist of stable native Coastal Plain deposits, similar to those encountered in our borings, or new imported fill soils meeting the material requirements of the aforementioned section, an available CBR value of at least 20 percent will be available for pavement support. This results in a resilient modulus of at least 17,380 psi available for flexible pavement design. If materials having lesser subgrade support values are to be considered for use, the pavement design should be reevaluated and required pavement thickness may need to be increased as a result.

REFERENCE ONLY

Flexible pavement design assumes an initial serviceability of 4.2 and a terminal serviceability index of 2.0, and a reliability factor of 95 percent. ESALs per axle were estimated using data provided in AASHTO literature. Assuming that only SCDOT approved source materials will be used in flexible pavement section construction, we used a structural layer coefficient of 0.44 for the HMA layers and a coefficient of 0.18 for the graded aggregate base course (GABC). A sub-base drainage factor of 0.9 was assigned, based upon the assumption that the sub-base soils will likely consist of poorly graded sands with silt.

For the purposes of our traffic analysis, we have assumed the following traffic loading may be experienced by the turn lanes. Based on the provided information and our experience with similar projects, we estimate that site pavements may experience traffic consisting of the following vehicles, loading, and frequencies:

- Automobiles and light trucks – 1,000 one-way trips per day, 365 days per year, for 20 years – average vehicle factor of 0.001, 18-kip Equivalent Single Axle Load (ESAL) per pass.
- Light Delivery Trucks or Small Passenger Buses – 60 one-way trips per day, 365 days per year, for 20 years – average vehicle factor of 0.7, 18-kip ESALs per pass.
- Large Buses and other Dual Single-axle Vehicles – 80 one-way trips per day, 365 days per year, for 20 years – average vehicle factor of 1.5, 18-kip ESALs per pass.
- Medium weight Unarticulated Trucks – 100 one-way trips per day, 365 days per year, for 20 years – average vehicle factor of 1.0, 18-kip ESALs per pass.



- Tractor Trailers and other Articulated Trucks – 100 one-way trips per day, 365 days per year, for 20 years – average vehicle factor of 3.0, 18-kip ESALs per pass.
- Garbage Trucks/Fire Trucks/Very Heavy Trucks – 20 one-way trips per week for 20 years – average vehicle factor of 4.0, 18-kip ESALs per pass.

The above traffic assumptions result in a traffic demand of about 4,193,000 ESALs over the design life of the pavement. This represents a relatively heavily traveled road, but in the absence of any provided traffic data, this assumption considers that the lanes will be used for turnarounds by traffic not entering the industrial park. Based on this traffic demand, the minimum pavement section thicknesses for asphaltic pavements shown in Table 1 below should be sufficient to carry the anticipated traffic loading with reasonable factors of safety. If the actual traffic loads are greater than the assumed values or trips, then the pavement section may need to be increased above the values provided in Table 1. If the traffic loads are significantly less than the assumed values or trips, then you may contact S&ME to discuss a reduction in the pavement section layer thicknesses.

**Important:** There may be SCDOT minimum pavement section thickness requirements that could supersede the theoretical pavement section requirements based on the estimated traffic loading using a fatigue-based analysis. The design engineer should consider any minimum requirements prior to final design of the section.

**Table 1: Recommended Pavement Section<sup>(a)</sup>**

Pavement Type	Theoretical Available Traffic Capacity (ESALs)	HMA Surface Course Type B (inches)	HMA Intermediate Course Type B (inches)	Compacted SCDOT Graded Aggregate Base Course [GABC] (inches)
Heavy Duty Flexible	4,840,000	2.0 or 225 lbs./sq.yd.	2.0 or 225 lbs./sq.yd.	10.0

(a)Single-stage construction and soil compaction as recommended is assumed; S&ME, Inc. must observe pavement subgrade preparations and pavement installation operations.

### Base Course and Pavement Section Construction

The following recommendations are provided for base course and pavement section construction:

1. Prior to placement of base course stone, all exposed pavement subgrades should be methodically proofrolled by the contractor under the observation of the Geotechnical Engineer (S&ME), and any identified unstable areas should be repaired. Pavement subgrades should not exhibit rutting or pumping under the proofroll load. Rutting or pumping areas shall be undercut and replaced and/or stabilized as directed by the engineer.
2. Crushed stone aggregate base material used in pavement section construction should consist of graded aggregate base course (GABC) as defined by Section 305 of the South Carolina Department of Transportation *Standard Specifications for Highway Construction* (2007). The base course should be compacted to at least **100 percent** of the modified Proctor maximum dry density (SC-T-140). After



placement of base course stone, the surface should be methodically proofrolled at final base grade elevation by the contractor under the observation of the Geotechnical Engineer (S&ME), and any identified unstable areas should be repaired. The base course material should not exhibit pumping or rutting under equipment traffic. Rutting or pumping areas shall be undercut and replaced and/or stabilized as directed by the engineer.

3. 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 near optimum moisture content in order to facilitate proper compaction.
4. Construct the surface course HMA in accordance with the specifications of Sections 401 and 403 of the South Carolina Department of Transportation *Standard Specifications for Highway Construction* (2007 edition). Construct the intermediate course HMA in accordance with the specifications of Sections 402 and 403 of the specification. 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.
5. Experience indicates that a thin surface overlay of asphalt pavement may be required in about 7 to 10 years due to normal wear and weathering of the surface. Such wear is typically visible in several forms of pavement distress, such as aggregate exposure and polishing, aggregate stripping, asphalt bleeding, and various types of cracking. There are means to methodically estimate the remaining pavement life based on a systematic statistical evaluation of pavement distress density and mode of failure. We recommend the pavement be evaluated in about 7 years to assess the pavement condition and remaining life.

#### ◆ Limitations of this Report

**REFERENCE ONLY**

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.

◆ Closure

S&ME, Inc. appreciates the opportunity to have provided our services on this project. If you have any questions concerning this report, please do not hesitate to contact us.

Sincerely,

S&ME, Inc.

*Jonathan M. Prevatte*  
Jonathan M. Prevatte,  
Geotechnical Staff Professional



*Ronald P. Forest, Jr.*  
Ronald P. Forest, Jr.,  
Senior Engineer  
Registration No. SC 21248

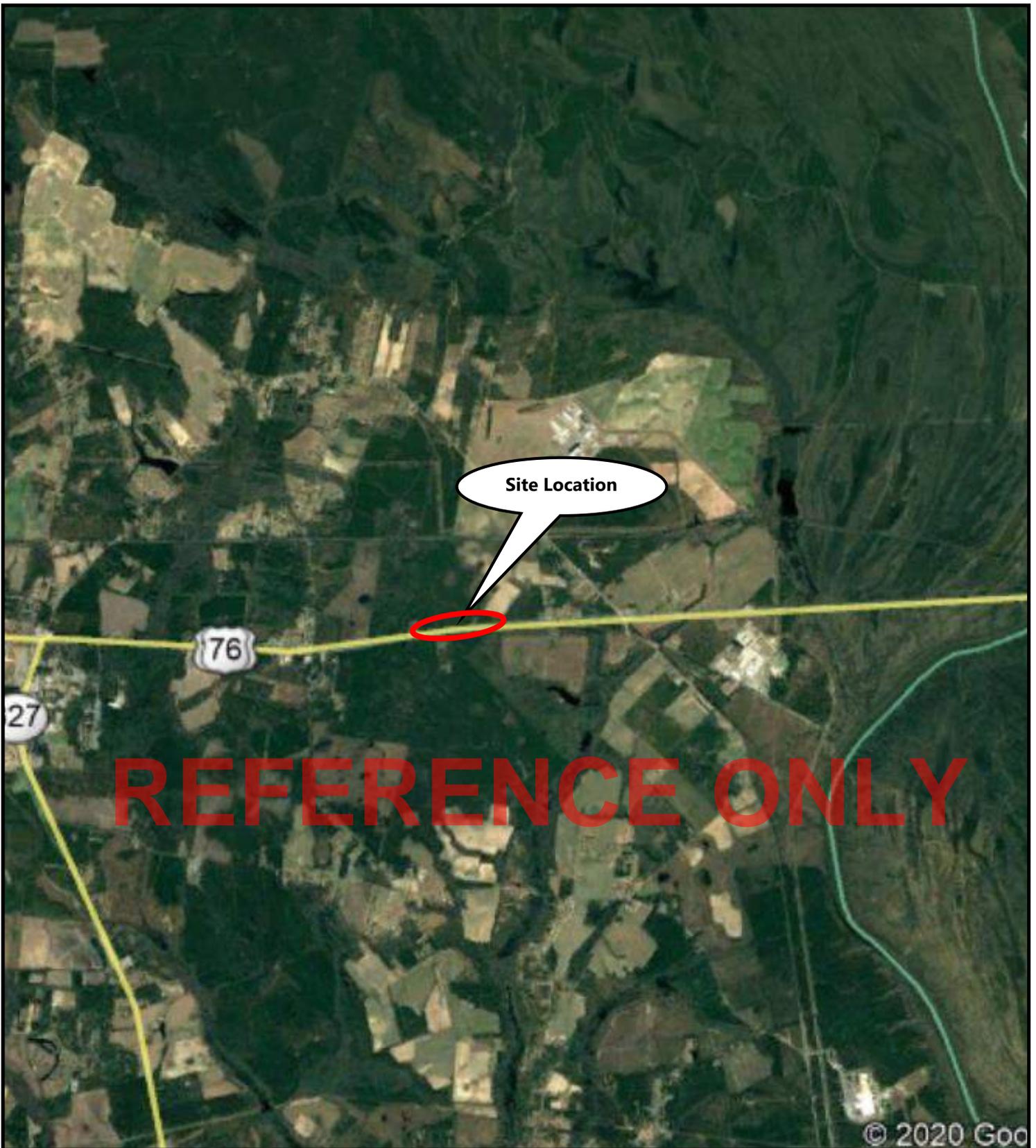


Attachments: Appendices

REFERENCE ONLY

**Attachments: Appendices**

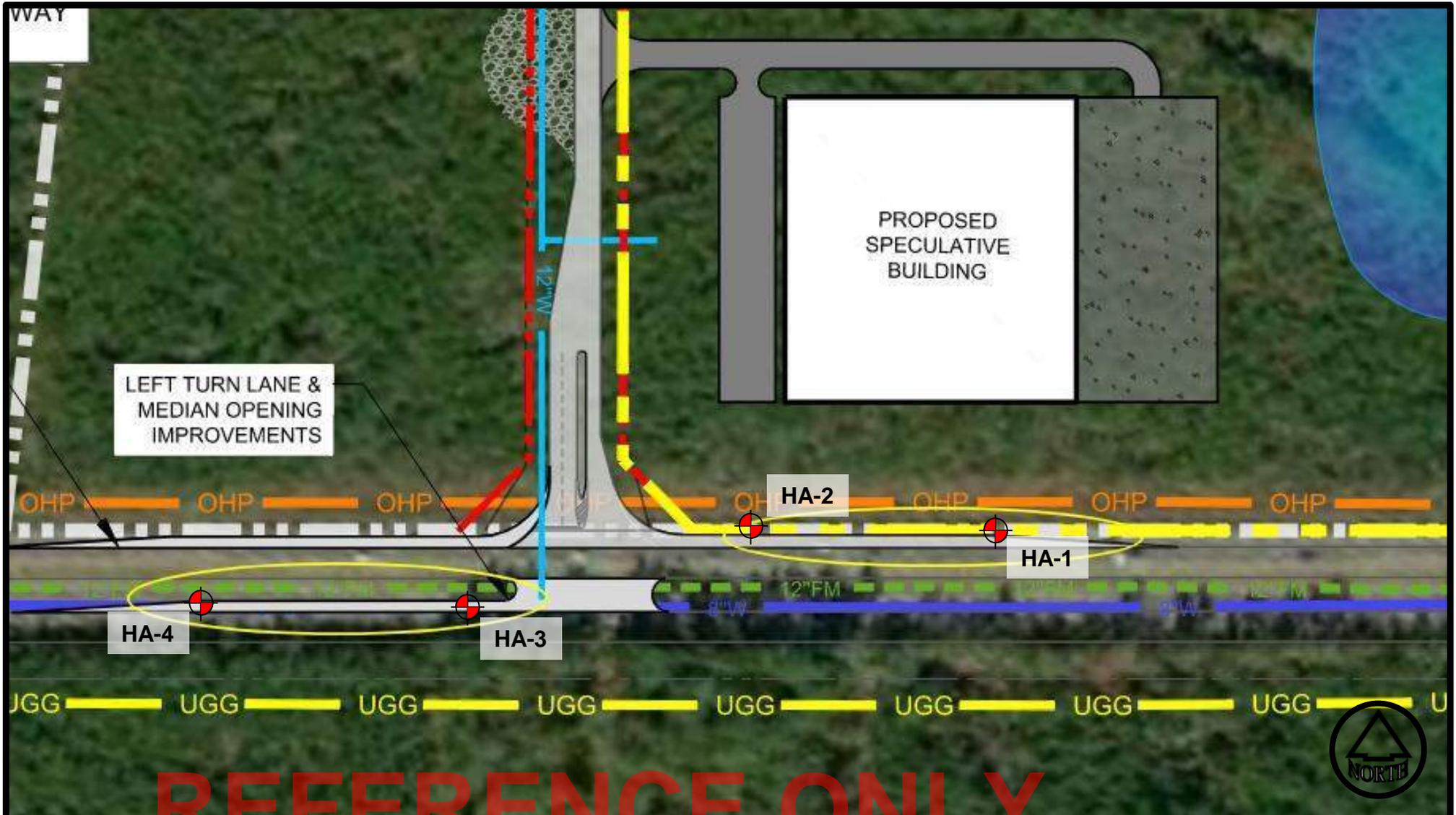
**REFERENCE ONLY**



REFERENCE:  
Image Courtesy of Google Earth



	<h2>Site Vicinity Map</h2>	SCALE: Not to Scale	FIGURE NO.  <h1>1</h1>
	Florence Industrial Park Florence, South Carolina	DATE: 12-3-20	
		PROJECT NUMBER 1339-20-035	



REFERENCE ONLY

**LEGEND**

= Approximate Test Location

**REFERENCE:**

Image Courtesy of Thomas and Hutton



**APPROXIMATE TEST LOCATION SKETCH**

Florence Industrial Park  
Florence, South Carolina

SCALE:	FIGURE NO.
NOT TO SCALE	<b>2</b>
DATE:	
PROJECT NUMBER:	
1339-20-035	

## ❖ Summary of Exploration Procedures

The American Society for Testing and Materials (ASTM) publishes standard methods to explore soil, rock and ground water conditions in Practice D-420-98, "*Standard Guide to Site Characterization for Engineering Design and Construction Purposes.*" The boring and sampling plan must consider the geologic or topographic setting. It must consider the proposed construction. It must also allow for the background, training, and experience of the geotechnical engineer. While the scope and extent of the exploration may vary with the objectives of the client, each exploration includes the following key tasks:

- ◆ Reconnaissance of the Project Area
- ◆ Preparation of Exploration Plan
- ◆ Layout and Access to Field Sampling Locations
- ◆ Field Sampling and Testing of Earth Materials
- ◆ Laboratory Evaluation of Recovered Field Samples
- ◆ Evaluation of Subsurface Conditions

The standard methods do not apply to all conditions or to every site. Nor do they replace education and experience, which together make up engineering judgment. Finally, ASTM D 420 does not apply to environmental investigations.

## ❖ Reconnaissance of the Project Area

We walked over the site to note land use, topography, ground cover, and surface drainage. We observed general access to proposed sampling points and noted any existing structures.

Checks for Hazardous Conditions - State law requires that we notify South Carolina 811 (SC811) before we drill or excavate at any site. SC811 is operated by the major water, sewer, electrical, telephone, CATV, and natural gas suppliers of South Carolina. SC811 forwarded our location request to the participating utilities. Location crews then marked buried lines with colored flags within 72 hours. They did not mark utility lines beyond junction boxes or meters. We checked proposed sampling points for conflicts with marked utilities, overhead power lines, tree limbs, or man-made structures during the site walkover.

## ❖ Boring and Sampling

### Hand Auger Borings

Auger borings were advanced using hand-operated augers. The soils encountered were identified in the field by cuttings brought to the surface. Representative samples of the cuttings were placed in plastic bags and transported to the laboratory. Soil consistency was qualitatively estimated by the relative difficulty of advancing the augers.

### Standard Dynamic Cone Penetrometer (DCP)

At selected intervals, the augers were withdrawn and soil consistency measured with a dynamic cone penetrometer. The conical point of the penetrometer was first seated 1-3/4 inches to penetrate any loose cuttings in the boring, then driven two additional 1-3/4 inch increments by a 15 pound hammer falling 20 inches. The number of hammer blows required to achieve this penetration was recorded. When properly evaluated by qualified professional staff, the blow count is an index to the soil strength and ability to support foundations.

## *Summary of Exploration Procedures - Continued*

### **Backfilling of Borings**

Once groundwater levels were obtained, boring spoils were backfilled into the open hand auger bore holes.

**REFERENCE ONLY**

# LEGEND TO SOIL CLASSIFICATION AND SYMBOLS

## SOIL TYPES

(Shown in Graphic Log)

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

## WATER LEVELS

(Shown in Water Level Column)

-  = Water Level At Termination of Boring
-  = Water Level Taken After 24 Hours
-  = Loss of Drilling Water
- HC = Hole Cave

## CONSISTENCY OF COHESIVE SOILS

### CONSISTENCY

Very Soft	STD. PENETRATION RESISTANCE BLOWS/FOOT
Soft	0 to 2
Firm	3 to 4
Stiff	5 to 8
Very Stiff	9 to 15
Hard	16 to 30
Very Hard	31 to 50
	Over 50

## RELATIVE DENSITY OF COHESIONLESS SOILS

### RELATIVE DENSITY

Very Loose	STD. PENETRATION RESISTANCE BLOWS/FOOT
Loose	0 to 4
Medium Dense	5 to 10
Dense	11 to 30
Very Dense	31 to 50
	Over 50

## SAMPLER TYPES

(Shown in Samples Column)

Shelby Tube

 Split Spoon

 Rock Core

 No Recovery

REFERENCE ONLY

## TERMS

**Standard Penetration Resistance** - The Number of Blows of 140 lb. Hammer Falling 30 in. Required to Drive 1.4 in. I.D. Split Spoon Sampler 1 Foot. As Specified in ASTM D-1586.

**REC** - Total Length of Rock Recovered in the Core Barrel Divided by the Total Length of the Core Run Times 100%.

**RQD** - Total Length of Sound Rock Segments Recovered that are Longer Than or Equal to 4" (mechanical breaks excluded) Divided by the Total Length of the Core Run Times 100%.



PROJECT: Florence Industrial Park Supplemental Florence, South Carolina 1339-20-035		HAND AUGER BORING LOG: HA-1				
DATE STARTED: 12/7/20		DATE FINISHED: 12/7/20		NOTES: Elevation Unknown		
SAMPLING METHOD: Hand Auger		PERFORMED BY: S&ME/J. Prevatte				
WATER LEVEL: Not Encountered						
Depth (feet)	GRAPHIC LOG	MATERIAL DESCRIPTION	ELEVATION (feet)	WATER LEVEL	DYNAMIC CONE PENETRATION RESISTANCE (blows/1.75 in.)	DCP VALUE
		<b>FILL SILTY SAND (SM)</b> - Very loose, brown to orange, mostly fine to medium sand, some low plasticity to non-plastic fines, moist.			10 20 30 60 80	2
1						3
2						4
3		<b>CLAYEY SAND (SC)</b> - Loose, orange, mostly fine to medium sand, some low to medium plasticity fines, moist.				5
4						6
5		Boring terminated at 5 ft Target Depth				6

REFERENCE ONLY

DCP INDEX IS THE DEPTH (IN.) OF PENETRATION PER BLOW OF A 10.1 LB HAMMER FALLING 22.6 IN., DRIVING A 0.79 IN. O.D. 60 DEGREE CONE.

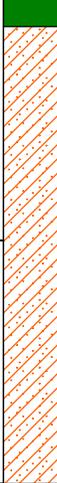


PROJECT:		Florence Industrial Park Supplemental Florence, South Carolina 1339-20-035		HAND AUGER BORING LOG: HA-2						
DATE STARTED:		12/7/20	DATE FINISHED:		12/7/20	NOTES: Elevation Unknown				
SAMPLING METHOD:		Hand Auger	PERFORMED BY:		S&ME/J. Prevatte					
WATER LEVEL:		Not Encountered								
Depth (feet)	GRAPHIC LOG	MATERIAL DESCRIPTION	ELEVATION (feet)	WATER LEVEL	DYNAMIC CONE PENETRATION RESISTANCE (blows/1.75 in.)		DCP VALUE			
					10	20	30	60	80	
		<b>TOPSOIL</b> - 3 inches.								2
1		<b>FILL SILTY SAND (SM)</b> - Very loose, brown and gray, mostly fine to medium sand, some low plasticity to non-plastic fines, moist.								3
2		<b>FILL CLAYEY SAND (SC)</b> - Very loose, orange, mostly fine to medium sand, some low to medium plasticity fines, moist.								3
		<b>SILTY SAND (SM)</b> - Very loose, orange and gray, mostly fine to medium sand, some low plasticity to non-plastic fines, moist.								3
3		<b>CLAYEY SAND (SC)</b> - Very loose to loose, tan and orange, mostly fine to medium sand, some low to medium plasticity fines, moist.								4
4										7
5		Boring terminated at 5 ft Target Depth								6

REFERENCE ONLY



DCP INDEX IS THE DEPTH (IN.) OF PENETRATION PER BLOW OF A 10.1 LB HAMMER FALLING 22.6 IN., DRIVING A 0.79 IN. O.D. 60 DEGREE CONE.

PROJECT:		Florence Industrial Park Supplemental Florence, South Carolina 1339-20-035		<b>HAND AUGER BORING LOG: HA-3</b>		
DATE STARTED: 12/7/20		DATE FINISHED: 12/7/20		NOTES: Elevation Unknown		
SAMPLING METHOD: Hand Auger		PERFORMED BY: S&ME/J. Prevatte				
WATER LEVEL: Not Encountered						
Depth (feet)	GRAPHIC LOG	MATERIAL DESCRIPTION	ELEVATION (feet)	WATER LEVEL	DYNAMIC CONE PENETRATION RESISTANCE (blows/1.75 in.)	DCP VALUE
		TOPSOIL - 1 inches.			10 20 30 60 80	1
1		<b>FILL</b> CLAYEY SAND (SC) - Very loose to loose, orange, mostly fine to medium sand, some low to medium plasticity fines, moist.  --- Some silty sand lenses.				5
2		CLAYEY SAND (SC) - Loose, gray and tan, mostly fine to medium sand, some low to medium plasticity fines, moist.				9
3		CLAYEY SAND (SC) - Loose, gray and tan, mostly fine to medium sand, some low to medium plasticity fines, moist.  --- Medium dense, some poorly graded sand lenses.				20+
4		SANDY LEAN CLAY (CL) - Soft to Firm, orange and gray, mostly low to medium plasticity fines, some fine sand moist.				5
5		Boring terminated at 5 ft Target Depth				4

REFERENCE ONLY

DCP INDEX IS THE DEPTH (IN.) OF PENETRATION PER BLOW OF A 10.1 LB HAMMER FALLING 22.6 IN., DRIVING A 0.79 IN. O.D. 60 DEGREE CONE.



PROJECT:		Florence Industrial Park Supplemental Florence, South Carolina 1339-20-035		HAND AUGER BORING LOG: HA-4			
DATE STARTED:		12/7/20	DATE FINISHED:		12/7/20	NOTES:	
						Elevation Unknown	
SAMPLING METHOD:		Hand Auger	PERFORMED BY:		S&ME/J. Prevatte		
WATER LEVEL:		Not Encountered					
Depth (feet)	GRAPHIC LOG	MATERIAL DESCRIPTION	ELEVATION (feet)	WATER LEVEL	DYNAMIC CONE PENETRATION RESISTANCE (blows/1.75 in.)		DCP VALUE
					10 20 30 60 80		
		TOPSOIL - 2 inches.					10
1		<u>FILL</u> CLAYEY SAND (SC) - loose, orange, mostly fine to medium sand, some low to medium plasticity fines, moist.					10
2		CLAYEY SAND (SC) - Medium dense to loose, brown and gray, mostly fine to medium sand, some low to medium plasticity fines, moist.					20+
3		--- Some poorly graded sand lenses.					6
4							8
5		Boring terminated at 5 ft Target Depth					8

REFERENCE ONLY



DCP INDEX IS THE DEPTH (IN.) OF PENETRATION PER BLOW OF A 10.1 LB HAMMER FALLING 22.6 IN., DRIVING A 0.79 IN. O.D. 60 DEGREE CONE.

## ❖ Summary of Laboratory Testing Procedures

### Examination of Recovered Soil Samples

Soil and field records were reviewed in the laboratory by the geotechnical professional. Soils were classified in general accordance with the visual-manual method described in ASTM D 2488, *"Standard Practice for Description and Identification of Soils (Visual-Manual Method)"*.

Representative soil samples were selected for classification testing to provide grain size and plasticity data to allow classification of the samples in general accordance with the Unified Soil Classification System method described in ASTM D 2487, *"Standard Practice for Classification of Soils for Engineering Purposes"*. The geotechnical professional also prepared the final boring and sounding records enclosed with this report.

### Moisture Content Testing of Soil Samples by Oven Drying

Moisture content was determined in general conformance with the methods outlined in ASTM D 2216, *"Standard Test Method for Laboratory Determination of Water (Moisture) Content of Soil or Rock by Mass."* This method is limited in scope to Group B, C, or D samples of earth materials which do not contain appreciable amounts of organic material, soluble solids such as salt or reactive solids such as cement. This method is also limited to samples which do not contain contamination.

A representative portion of the soil was divided from the sample using one of the methods described in Section 9 of ASTM D 2216. The split portion was then placed in a drying oven and heated to approximately 110 degrees C overnight or until a constant mass was achieved after repetitive weighing. The moisture content of the soil was then computed as the mass of water removed from the sample by drying, divided by the mass of the sample dry, times 100 percent. No attempt was made to exclude any particular particle size from the portion split from the sample.

### Percent Fines Determination of Samples

A selected specimen of soils was washed over a No. 200 sieve after being thoroughly mixed and dried. This test was conducted in general accordance with ASTM D 1140, *"Standard Test Method for Amount of Material Finer Than the No. 200 Sieve."* Method A, using water to wash the sample through the sieve without soaking the sample for a prescribed period of time, was used and the percentage by weight of material washing through the sieve was deemed the "percent fines" or percent clay and silt fraction.

### Liquid and Plastic Limits Testing

Atterberg limits of the soils was determined generally following the methods described by ASTM D 4318, *"Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils."* Albert Atterberg originally defined "limits of consistency" of fine grained soils in terms of their relative ease of deformation at various moisture contents. In current engineering usage, the liquid limit of a soil is defined as the moisture content, in percent, marking the upper limit of viscous flow and the boundary with a semi-liquid state. The plastic limit defines the lower limit of plastic behavior, above which a soil behaves plastically below which it retains its shape upon drying. The plasticity

## ***Summary of Laboratory Testing Procedures - Continued***

index (PI) is the range of water content over which a soil behaves plastically. Numerically, the PI is the difference between liquid limit and plastic limit values.

Representative portions of fine grained Group A, B, C, or D samples were prepared using the wet method described in Section 10.1 of ASTM D 4318. The liquid limit of each sample was determined using the multipoint method (Method A) described in Section 11. The liquid limit is by definition the moisture content where 25 drops of a hand operated liquid limit device are required to close a standard width groove cut in a soil sample placed in the device. After each test, the moisture content of the sample was adjusted and the sample replaced in the device. The test was repeated to provide a minimum of three widely spaced combinations of N versus moisture content. When plotted on semi-log paper, the liquid limit moisture content was determined by straight line interpolation between the data points at N equals 25 blows.

The plastic limit was determined using the procedure described in Section 17 of ASTM D 4318. A selected portion of the soil used in the liquid limit test was kneaded and rolled by hand until it could no longer be rolled to a 3.2 mm thread on a glass plate. This procedure was repeated until at least 6 grams of material was accumulated, at which point the moisture content was determined using the methods described in ASTM D 2216.

### **Compaction Tests of Soils Using Modified Effort**

Soil placed as engineering fill is compacted to a dense state to obtain satisfactory engineering properties. Laboratory compaction tests provide the basis for determining the percent compaction and water content needed to achieve the required engineering properties, and for controlling construction to assure the required compaction and water contents are achieved. Test procedures generally followed those described by ASTM D 1557, "Standard Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 lbf/ft<sup>3</sup>)."

The relationship between water content and the dry unit weight is determined for soils compacted in a 4 inch diameter molds with a 10 lb rammer dropped from a height of 18 inches, producing a compactive effort of 56,000 lbf/ft<sup>3</sup>.

Soil was compacted in the mold in five layers of approximately equal thickness, each compacted with 25 blows of the rammer. After compaction of the sample in the mold, the resulting dry density and moisture content was determined and the procedure repeated. Separate soils were used for each sample point, adjusting the moisture content of the soil as described in Section 10.2 (Moist Preparation Method). The procedure was repeated for a sufficient number of water content values to allow the dry density vs. water content values to be plotted and the maximum dry density and optimum moisture content to be determined from the resulting curvilinear relationship.

### **Laboratory California Bearing Ratio Tests of Compacted Samples**

This method is used to evaluate the potential strength of subgrade, subbase, and base course material, including recycled materials, for use in road and airfield pavements. Laboratory CBR tests were run in general accordance with the procedures laid out in ASTM D 1883, "Standard Test Method for CBR (California Bearing Ratio) of Laboratory Compacted Soils." Specimens were prepared in standard molds using two different levels of compactive effort within plus or minus 0.5 percent of the optimum moisture content value. While embedded in the compaction mold,

### ***Summary of Laboratory Testing Procedures - Continued***

each sample was inundated for a minimum period of 96 hours to achieve saturation. During inundation the specimen was surcharged by a weight approximating the anticipated weight of the pavement and base course layers. After removing the sample from the soaking bath, the soil was then sheared by jacking a piston having a cross sectional area of 3 square inches into the end surface of the specimen. The piston was jacked 0.5 inches into the specimen at a constant rate of 0.05 inches per minute.

The CBR is defined as the load required to penetrate a material to a predetermined depth, compared to the load required to penetrate a standard sample of crushed stone to the same depth. The CBR value was usually based on the load ratio for a penetration of 0.10 inches, after correcting the load-deflection curves for surface irregularities or upward concavity. However, where the calculated CBR for a penetration of 0.20 inches was greater than the result obtained for a penetration of 0.10 inches, the test was repeated by reversing the specimen and shearing the opposite end surface. Where the second test indicated a greater CBR at 0.20 inches penetration, the CBR for 0.20 inches penetration was used.

**REFERENCE ONLY**





## LIQUID LIMIT, PLASTIC LIMIT, & PLASTIC INDEX



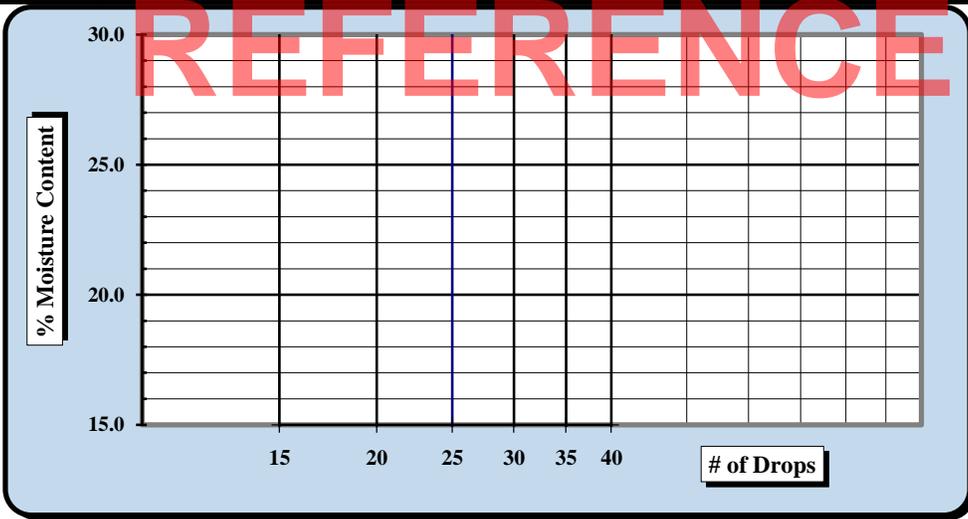
ASTM D 4318  AASHTO T 89  AASHTO T 90

S&ME, Inc. - Florence: 2327 Prosperity Way, Suite 9, Florence, SC 29501

Project #:	1339-20-035	Report Date:	12/15/20
Project Name:	Florence Industrial Park	Test Date(s)	12/14/20
Client Name:	Thomas & Hutton		
Client Address:	1501 Main Street, Ste. 760; Columbia, South Carolina 29201		
Boring #:	HA-1 to HA-4	Sample #:	Bulk
		Sample Date:	12/7/20
Location:	Pavement Areas		Depth : 1' - 2'

Sample Description: Brown and Orange Silty Sand (SM)					
Type and Specification	S&ME ID #	Cal Date:	Type and Specification	S&ME ID #	Cal Date:
Balance (0.01 g)	24496	11/14/2019	Grooving tool	34452	9/9/2019
LL Apparatus	34453	9/9/2019			
Oven	24457	11/14/2019			

Pan #		Liquid Limit					Plastic Limit		
		Tare #:							
A	Tare Weight								
B	Wet Soil Weight + A								
C	Dry Soil Weight + A								
D	Water Weight (B-C)								
E	Dry Soil Weight (C-A)								
F	% Moisture (D/E)*100								
N	# OF DROPS								
LL	LL = F * FACTOR								
Ave.	Average								



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

Plastic Limit **NP**

Plastic Index

Group Symbol **SM**

Multipoint Method

One-point Method

Wet Preparation  Dry Preparation  Air Dried  Estimate the % Retained on the #40 Sieve: 10%

Notes / Deviations / References:

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

<u>J. Prevatte</u> Technician Name	<u>12/15/2020</u> Date	<u>W. Kannon</u> Technical Responsibility	<u>12/15/2020</u> Date
---------------------------------------	---------------------------	--	---------------------------

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## LIQUID LIMIT, PLASTIC LIMIT, & PLASTIC INDEX



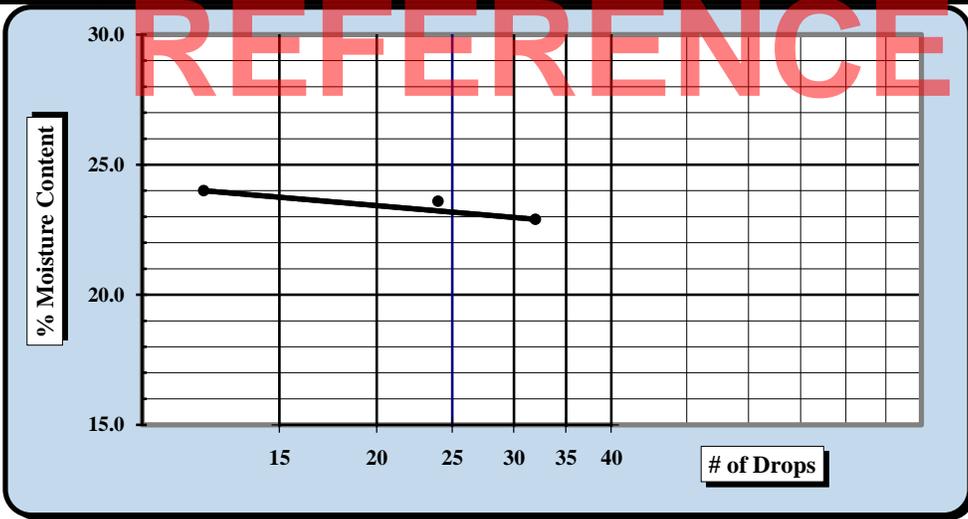
ASTM D 4318  AASHTO T 89  AASHTO T 90

S&ME, Inc. - Florence: 2327 Prosperity Way, Suite 9, Florence, SC 29501

Project #:	1339-20-035	Report Date:	12/15/20
Project Name:	Florence Industrial Park	Test Date(s)	12/14/20
Client Name:	Thomas & Hutton		
Client Address:	1501 Main Street, Ste. 760; Columbia, South Carolina 29201		
Boring #:	HA-3	Sample #:	S-1
		Sample Date:	12/7/20
Location:	Pavement Areas		Depth : 1' - 2'

Sample Description: Orange Clayey Sand (SC)					
Type and Specification	S&ME ID #	Cal Date:	Type and Specification	S&ME ID #	Cal Date:
Balance (0.01 g)	24496	11/14/2019	Grooving tool	34452	9/9/2019
LL Apparatus	34453	9/9/2019			
Oven	24457	11/14/2019			

Pan #	Tare #:	Liquid Limit				Plastic Limit		
		51	54	00		155	10	
A	Tare Weight	15.07	14.98	19.47		13.65	13.75	
B	Wet Soil Weight + A	26.01	24.05	24.89		20.14	21.09	
C	Dry Soil Weight + A	23.97	22.32	23.84		19.20	20.04	
D	Water Weight (B-C)	2.04	1.73	1.05		0.94	1.05	
E	Dry Soil Weight (C-A)	8.90	7.34	4.37		5.55	6.29	
F	% Moisture (D/E)*100	22.9%	23.6%	24.0%		16.9%	16.7%	
N	# OF DROPS	32	24	12		Moisture Contents determined by ASTM D 2216		
LL	LL = F * FACTOR							
Ave.	Average					<b>16.8%</b>		



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	<input type="checkbox"/>
Liquid Limit	<b>24</b>
Plastic Limit	<b>17</b>
Plastic Index	<b>7</b>
Group Symbol	<b>SC</b>

Multipoint Method   
 One-point Method

Wet Preparation  Dry Preparation  Air Dried  Estimate the % Retained on the #40 Sieve: 10%

Notes / Deviations / References:

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

J. Prevatte  
Technician Name

12/15/2020  
Date

W. Kannon  
Technical Responsibility

12/15/2020  
Date

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# MOISTURE - DENSITY REPORT

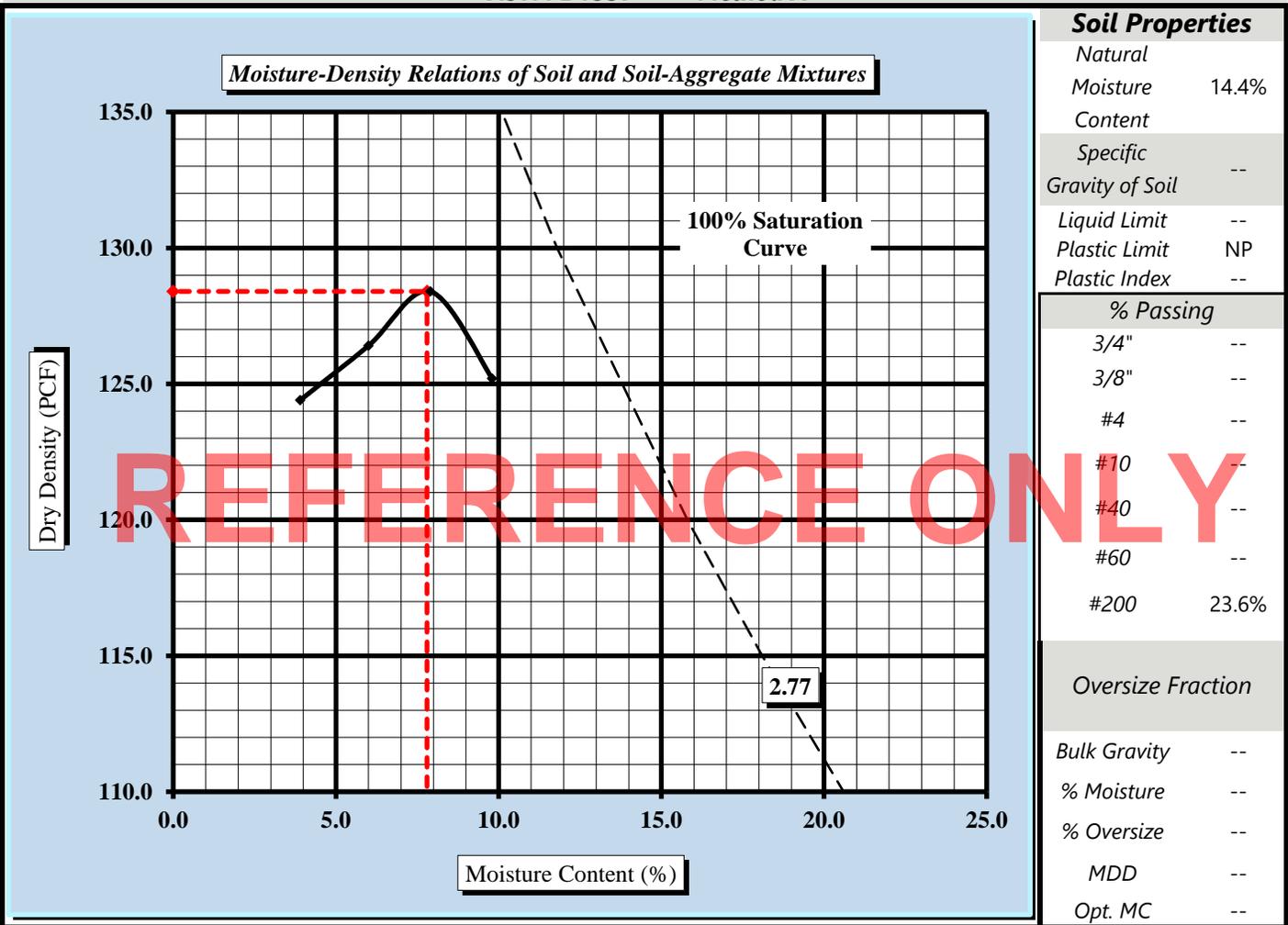


Quality Assurance

S&ME, Inc. - Myrtle Beach: 1330 Highway 501 Business, Conway, SC 29526			
S&ME Project #:	1339-20-035	Report Date:	1/0/1900
Project Name:	Florence Industrial Park	Test Date(s):	12/10/2020
Client Name:	Thomas & Hutton		
Client Address:	1501 Main Street, #760; Columbia, SC 29201		
Boring #:	HA-1 through HA-4	Sample #:	Bulk-1
		Sample Date:	12/10/2020
Location:	Hand Augers	Depth:	1'-2'
Sample Description:	Brown and Orange Silty Sand (SM)		

**Maximum Dry Density 128.4 PCF. Optimum Moisture Content 7.8%**

**ASTM D1557 - - Method A**



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 1557: Laboratory Compaction Characteristics of Soil Using Modified Effort

William Kannon  
 Technical Responsibility

William Kannon  
 Signature

Project Engineer  
 Position

12/15/2020  
 Date

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**CBR (CALIFORNIA BEARING RATIO)  
OF LABORATORY COMPACTED SOIL**



ASTM D 1883

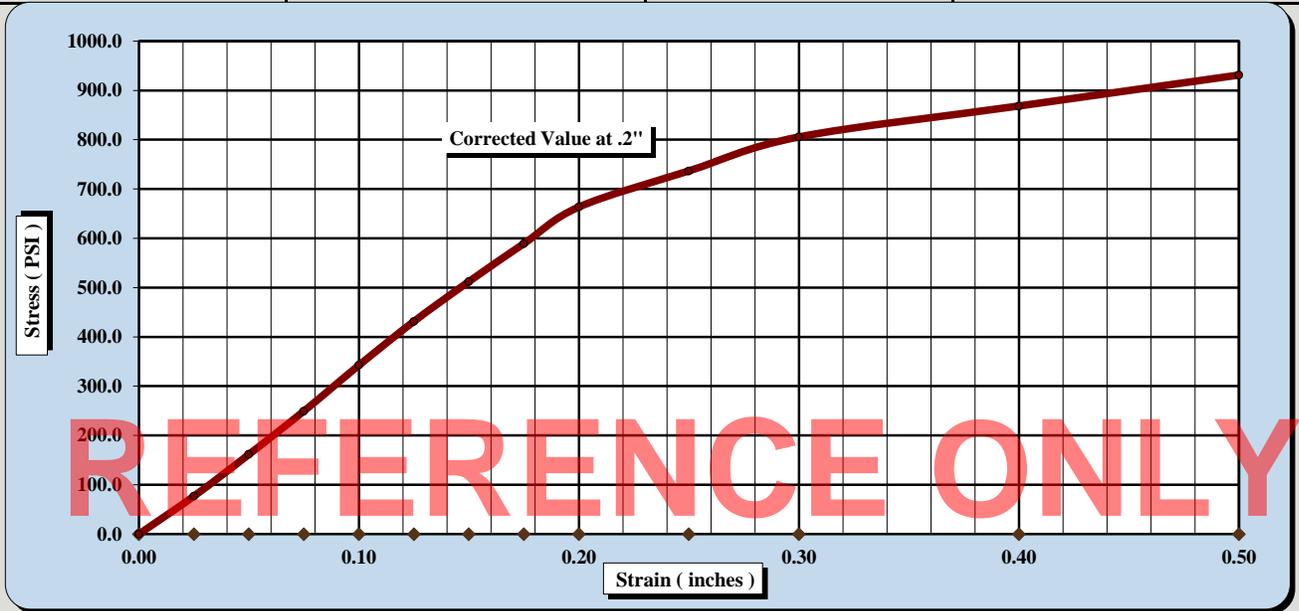
S&ME, Inc. - Myrtle Beach: 1330 Highway 501 Business, Conway, SC 29526

Project #:	1339-20-035	Report Date:	
Project Name:	Florence Industrial Park	Test Date(s)	12/10/2020
Client Name:	Thomas & Hutton	Amended Report	
Client Address:	1501 Main Street, #760; Columbia, SC 29201	Original Report 2/31/07	
Boring #:	HA-1 to HA-4	Sample #:	Bulk-1
		Sample Date:	12/10/2020
Location:	Pavement Areas	Depth:	1'-2'

Sample Description: Brown and Orange Silty Sand (SM)

ASTM D1557 Method A	Maximum Dry Density:	128.4 PCF	Optimum Moisture Content:	7.8%
Compaction Test performed on grading complying with CBR spec.			% Retained on the 3/4" sieve:	1.0%

Uncorrected CBR Values		Corrected CBR Values	
CBR at 0.1 in.	34.2	CBR at 0.1 in.	34.3
CBR at 0.2 in.	44.2	CBR at 0.2 in.	44.2



CBR Sample Preparation:

*The entire gradation was used and compacted in a 6" CBR mold in accordance with ASTM D1883, Section 6.1.1*

Before Soaking		After Soaking	
Compactive Effort (Blows per Layer)	25	Final Dry Density (PCF)	122.5
Initial Dry Density (PCF)	122.5	Moisture Content (top 1" after soaking)	10.1%
Moisture Content of the Compacted Specimen	7.9%	Percent Swell	0.0%
Percent Compaction	95.4%		

Soak Time:	96 hrs.	Surcharge Weight	20.0	Surcharge Wt. per sq. Ft.	101.8
Liquid Limit		Plastic Index	NP	Apparent Relative Density	--

Notes/Deviations/References: Liquid Limit: ASTM D 4318, Specific Gravity: ASTM D 854, Classification: ASTM D 2487

William Kannon  
Technical Responsibility

*William Kannon*  
Signature

Project Engineer  
Position

12/15/2020  
Date

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**INDEX TO**  
**SECTION 01025**  
**MEASUREMENT AND PAYMENT**

<b>Paragraph</b>	<b>Title</b>	<b>Page</b>
<b>PART 1 - GENERAL</b>		
1.1	Section Includes	01025-1
1.2	Authority	01025-1
1.3	Unit Quantities Specified	01025-1
1.4	Measurement of Quantities	01025-1
1.5	Payment	01025-2

**PART 2 - PRODUCTS**

Not Used

**PART 3 - EXECUTION**

Not Used

**REFERENCE ONLY**

**SECTION 01025****MEASUREMENT AND PAYMENT****PART 1 - GENERAL****1.1 SECTION INCLUDES**

- A. Measurement and payment criteria applicable to the Work performed under a unit price or lump sum payment method.

**1.2 AUTHORITY**

- A. Measurement methods delineated in the individual specification sections complement the criteria of this section. In the event of conflict, the requirements of the individual specification section govern.
- B. Take all measurements and compute quantities. The Engineer will verify measurements and quantities.
- C. Assist by providing necessary equipment, workers, and survey personnel as required.

**1.3 UNIT QUANTITIES SPECIFIED**

- A. Quantities indicated in the Bid Form are for bidding and contract purposes only. Quantities and measurements supplied or placed in the Work and verified by the Engineer determine payment.
- B. If the actual Work requires more or fewer quantities than those quantities indicated, provide the required quantities at the unit sum/prices contracted.

**1.4 MEASUREMENT OF QUANTITIES**

- A. Measurement by Weight: Concrete reinforcing steel, rolled or formed steel or other metal shapes will be measured by handbook weights. Welded assemblies will be measured by handbook or scale weight.
- B. Measurement by Volume: Measured by cubic dimension using mean length, width and height or thickness.
- C. Measurement by Area: Measured by square dimension using mean length and width or radius.
- D. Linear Measurement: Measured by linear dimension, at the item centerline or mean chord.
- E. Stipulated Sum/Price Measurement: Items measured by weight, volume, area, or linear means or combination, as appropriate, as a completed item or unit of the Work.

**1.5 PAYMENT**

- A. Payment Includes: Full compensation for all required labor, products, tools, equipment, plant, transportation, services and incidentals; erection, application or installation of an item of the Work including overhead and profit.
- B. Final payment for Work governed by unit prices will be made on the basis of the actual measurements and quantities accepted by the Engineer multiplied by the unit sum/price for Work which is incorporated in or made necessary by the Work.

**PART 2 - PRODUCTS**

Not Used

**PART 3 - EXECUTION**

Not Used

**END OF SECTION**

**REFERENCE ONLY**

**SECTION 01135**

**BIDDER'S QUALIFICATIONS**

Please answer all questions and have your statement notarized. If necessary, you may answer questions on separate sheets of paper and attach them to this statement. Other additional information your firm deems useful in the evaluation of your capabilities may also be included.

**1. ORGANIZATION**

Date of Response: \_\_\_\_\_

Legal Name of Bidder: \_\_\_\_\_

Street Address: \_\_\_\_\_

City, State, Zip Code: \_\_\_\_\_

Website: \_\_\_\_\_

Contact: \_\_\_\_\_ Phone: \_\_\_\_\_ Mobile: \_\_\_\_\_

Email Address: \_\_\_\_\_

Is the address of the business listed above a: (Please circle one listed below)

Main Office                      Regional Office                      Branch Office

When Organized: \_\_\_\_\_  
When and Where Incorporated: \_\_\_\_\_



Licensed or Registered to Do Business in State of South Carolina:     Yes                       No

If No, In What (State) \_\_\_\_\_ Municipality does your Company Have A Business License?\_

Business License Number for Said (State) \_\_\_\_\_ Municipality: \_\_\_\_\_

Federal Employer I.D. Number: \_\_\_\_\_

If Partnership, list all partners and their addresses:

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

If there is no South Carolina Partner, give name and address of agent for service of process in South Carolina.

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

If an individual owner is not a South Carolina resident, give name and address of agent for service of process in South Carolina.

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Is your company: (Please circle one listed below)

MBE WBE DBE MBE/WBE/DBE Certified by:\_\_\_\_\_

Has your company or any of its principals ever petitioned for bankruptcy, failed in business, defaulted or been terminated on a contract awarded to you?

\_\_\_\_\_ Yes \_\_\_\_\_ No

Has your company ever been banned or otherwise precluded from pursuing public work or have ever been found to be non-responsive by a public agency?

\_\_\_\_\_ Yes \_\_\_\_\_ No

Has your company ever had a claim made against it for improper, delayed, or non-compliant work or failure to meet warranty obligations?

\_\_\_\_\_ Yes \_\_\_\_\_ No

Is your company or any of its owners, officers, or major shareholders currently involved in any arbitration or litigation?

\_\_\_\_\_ Yes \_\_\_\_\_ No

Does your company have any outstanding judgments or claims against it?

\_\_\_\_\_ Yes \_\_\_\_\_ No

Is your company currently involved or has been involved in the last 3 years with any litigation?

\_\_\_\_\_ Yes \_\_\_\_\_ No

Has your organization ever failed to complete any work awarded to it?

\_\_\_\_\_ Yes \_\_\_\_\_ No

If yes to any of the above questions, please explain: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Please list any litigation brought against your company in the past five (5) years asserting that you failed to make payments to anyone.

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Has your company ever had a contract terminated for any reason?

\_\_\_\_\_ Yes \_\_\_\_\_ No

If Yes, please explain: \_\_\_\_\_  
\_\_\_\_\_

List the geographical areas in which you work: \_\_\_\_\_  
\_\_\_\_\_

List the areas of work that you normally perform with your own forces: \_\_\_\_\_  
\_\_\_\_\_

What percentage of the Company's work is normally subcontracted? \_\_\_\_\_%

What is the largest contract your company has completed?

Amount \$ \_\_\_\_\_ Year \_\_\_\_\_

Project Name / Scope / Contact Information \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Should the work require compliance with the South Carolina State Construction Licensing Board Rules and Regulations, the Contractor and any Subcontractor shall list the appropriate License number(s):

Main Contractor's License Number: \_\_\_\_\_

Subcontractor #1 License Number: \_\_\_\_\_

Subcontractor #1 Name: \_\_\_\_\_

Subcontractor #2 License Number: \_\_\_\_\_

Subcontractor #2 Name: \_\_\_\_\_

Subcontractor #3 License Number: \_\_\_\_\_

Subcontractor #3 Name: \_\_\_\_\_

(List additional if appropriate)

Year Firm Established: \_\_\_\_\_

**2. EXPERIENCE – PRIME CONTRACTOR**

How many years have you been engaged in the contracting business under your present firm or trade name? \_\_\_\_\_

List jurisdictions and trade categories in which your organization is legally qualified to do business, and indicate registration or license numbers, if applicable.

\_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

Current Employment (Numbers of Employees): Total: \_\_\_\_\_

Management: \_\_\_\_\_ Clerical: \_\_\_\_\_ Professional: \_\_\_\_\_

Technical: \_\_\_\_\_ Skilled Labor: \_\_\_\_\_ Common Labor: \_\_\_\_\_

Total Value of Projects Completed (last five years): \$ \_\_\_\_\_

**A. Contracts on Hand**

REFERENCE ONLY

Project Name and Location	Owner Name Address Phone No.	Project Description	Bid \$	Actual \$	Anticipated Completion Date

**B. Selected Similar Construction Project Examples**

At Least Five (5) Projects Similar in Nature:

Project Name and Location	Owner Name Address Phone No.	Project Description	Bid \$	Actual \$	Completion Date

Has your company or your proposed subcontractors ever completed projects that included the following:

[List] **REFERENCE ONLY** Yes\_\_\_ No\_\_\_

[List] Yes\_\_\_ No\_\_\_

[List] Yes\_\_\_ No\_\_\_

[List] Yes\_\_\_ No\_\_\_

[List] Yes\_\_\_ No\_\_\_

**C. Safety Issues Disclosure:**

Contractor's Experience Modification Rate (EMR):  
 List Safety Issues for Last Five Years:

List Major Equipment Proposed To Be Used For This Project:

Description	Make/Model	Owned by Bidder or Sub?	Year Purchased
_____	_____	Yes ___ No ___	_____
_____	_____	Yes ___ No ___	_____
_____	_____	Yes ___ No ___	_____
_____	_____	Yes ___ No ___	_____
_____	_____	Yes ___ No ___	_____
_____	_____	Yes ___ No ___	_____
_____	_____	Yes ___ No ___	_____
_____	_____	Yes ___ No ___	_____
_____	_____	Yes ___ No ___	_____

REFERENCE ONLY

**D. Proposed Superintendent for this Project:**

Name: \_\_\_\_\_

Address: \_\_\_\_\_

**E. Select Project Experience of the Superintendent:**

Project Name and Location	Owner Name Address Phone No.	Project Description	Bid \$	Actual \$	Completion Date

**3. EXPERIENCE – WATERLINE CONTRACTOR**

How many years have you been engaged in the contracting business under your present firm or trade name? \_\_\_\_\_

List jurisdictions and trade categories in which your organization is legally qualified to do business, and indicate registration or license numbers, if applicable.

\_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_  
**REFERENCE ONLY**

Current Employment (Numbers of Employees): Total: \_\_\_\_\_

Management: \_\_\_\_\_ Clerical: \_\_\_\_\_ Professional: \_\_\_\_\_

Technical: \_\_\_\_\_ Skilled Labor: \_\_\_\_\_ Common Labor: \_\_\_\_\_

Total Value of Projects Completed (last five years): \$ \_\_\_\_\_

**F. Contracts On Hand**

Project Name and Location	Owner Name Address Phone No.	Project Description	Bid \$	Actual \$	Anticipated Completion Date

**G. Selected Similar Construction Project Examples**

At Least Five (5) Projects Similar in Nature:

Project Name and Location	Owner Name Address Phone No.	Project Description	Bid \$	Actual \$	Completion Date
REFERENCE ONLY					

Has your company or your proposed subcontractors ever completed projects that included the following:

- |        |             |
|--------|-------------|
| [List] | Yes___No___ |

**H. Safety Issues Disclosure:**

Contractor's Experience Modification Rate (EMR):  
List Safety Issues for Last Five Years:

List Major Equipment Proposed To Be Used For This Project:

Description	Make/Model	Owned by Bidder or Sub?		Year Purchased
		Yes ___	No ___	
_____	_____	Yes ___	No ___	_____
_____	_____	Yes ___	No ___	_____
_____	_____	Yes ___	No ___	_____
_____	_____	Yes ___	No ___	_____
_____	_____	Yes ___	No ___	_____
_____	_____	Yes ___	No ___	_____
_____	_____	Yes ___	No ___	_____
_____	_____	Yes ___	No ___	_____
_____	_____	Yes ___	No ___	_____

REFERENCE ONLY

**I. Proposed Superintendent for this Project:**

Name: \_\_\_\_\_

Address: \_\_\_\_\_

**J. Select Project Experience of the Superintendent:**

Project Name and Location	Owner Name Address Phone No.	Project Description	Bid \$	Actual \$	Completion Date

**4. REFERENCES** REFERENCE ONLY

Name of your Bank: \_\_\_\_\_

Address: \_\_\_\_\_

Phone: \_\_\_\_\_ Contact Person: \_\_\_\_\_

Amount of line of credit: \_\_\_\_\_ Amount Available: \_\_\_\_\_

Bonding Company: \_\_\_\_\_

Address: \_\_\_\_\_

Contact Person: \_\_\_\_\_ Phone: \_\_\_\_\_

Bonding Company's Rating: \_\_\_\_\_

Bonding Capacity: Per Job \$ \_\_\_\_\_ Aggregate \$ \_\_\_\_\_

Date of Last Bond: \_\_\_\_\_ Bond Amount \$ \_\_\_\_\_

Bond Rate: \_\_\_\_\_ Remaining Bonding Capacity \$ \_\_\_\_\_

Please list the persons or entities that provide indemnification to your Surety: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

List three of your major suppliers:

A. Company: \_\_\_\_\_  
Address: \_\_\_\_\_  
Phone: \_\_\_\_\_ Fax: \_\_\_\_\_  
Contact: \_\_\_\_\_

B. Company: \_\_\_\_\_  
Address: \_\_\_\_\_  
Phone: \_\_\_\_\_ Fax: \_\_\_\_\_  
Contact: \_\_\_\_\_

C. Company: \_\_\_\_\_  
Address: \_\_\_\_\_  
Phone: \_\_\_\_\_ Fax: \_\_\_\_\_  
Contact: \_\_\_\_\_

List three Contractors/Owners you do business with:

A. Company: \_\_\_\_\_  
Address: \_\_\_\_\_  
Phone: \_\_\_\_\_ Fax: \_\_\_\_\_  
Contact: \_\_\_\_\_

B. Company: \_\_\_\_\_  
Address: \_\_\_\_\_  
Phone: \_\_\_\_\_ Fax: \_\_\_\_\_  
Contact: \_\_\_\_\_

C. Company: \_\_\_\_\_  
Address: \_\_\_\_\_  
Phone: \_\_\_\_\_ Fax: \_\_\_\_\_  
Contact: \_\_\_\_\_

**REFERENCE ONLY**

**5. SIGNATURE**

The Undersigned certifies under oath that the information provided herein is true and sufficiently complete so as not to be misleading. The undersigned also recognizes that the Owner is relying on the accuracy of the information and the responses in deciding the demonstrated competence and qualifications for the type of required work.

The foregoing statement of qualifications is submitted under oath:

Respectfully submitted:

Company Name: \_\_\_\_\_

Street Address: \_\_\_\_\_

City, State, Zip: \_\_\_\_\_

By (Signed): \_\_\_\_\_

By (Typed): \_\_\_\_\_

Title: \_\_\_\_\_

Attach satisfactory evidence of the authority of the officer, or officers, signing on behalf of a corporation.

SWORN to before me this

\_\_\_\_ Day of \_\_\_\_\_, 20\_\_\_\_

\_\_\_\_ (SEAL)

Notary Public for \_\_\_\_\_

My Commission Expires: \_\_\_\_\_

**REFERENCE ONLY**

**INDEX TO**  
**DIVISION I – GENERAL REQUIREMENTS**  
**SECTION 01300**  
**SUBMITTALS**

<b>Paragraph</b>	<b>Title</b>	<b>Page</b>
<b>PART 1 – GENERAL</b>		
1.1	Section Includes	01300-1
1.2	Related Sections	01300-1
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1.6	Shop Drawings	01300-3
1.7	Samples	01300-4
1.8	Design Data	01300-4
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1.11	Manufacturer's Instructions	01300-5
1.12	Manufacturer's Field Reports	01300-5
1.13	Erection Drawings	01300-5
1.14	Reviewed Shop Drawings	01300-5
1.15	Submittal Checklist	01300-6

**REFERENCE ONLY**

**PART 2 – PRODUCTS**

Not Used.

**PART 3 – EXECUTION**

Not Used.

**DIVISION I – GENERAL REQUIREMENTS****SECTION 01300 – SUBMITTALS****PART 1 – GENERAL****1.1 SECTION INCLUDES**

- A. Submittal procedures.
- B. Construction progress schedules.
- C. Product Data.
- D. Shop Drawings.
- E. Samples.
- F. Design data.
- G. Test reports.
- H. Certificates.
- I. Manufacturer's instructions.
- J. Manufacturer's field reports.
- K. Erection drawings.

**1.2 RELATED SECTIONS**

- A. Section 01400 – Quality Control: Manufacturers' field services and reports.
- B. Section 01702 – Closeout Procedures: Contract warranties, bonds, manufacturers' certificates, and closeout submittals.

**1.3 SUBMITTAL PROCEDURES**

- A. Transmit each submittal with Engineer accepted form.
- B. Sequentially number the transmittal form. Revise submittals with original number and a sequential alphabetic suffix. Resubmit as specified for initial submittal. Indicate on revised drawings all changes that have been made other than those requested by the Engineer.
- C. Identify Project, Contractor, Subcontractor, or supplier; pertinent drawing and detail number, and specification section number, as appropriate.
- D. Apply Contractor's stamp, signed or initialed verifying review, approval, products required, field dimensions, adjacent construction Work, and coordination of

information is in accordance with the requirements of the Work and Contract Documents. Submittal without the Contractor's stamp will be returned to Contractor without Engineer's review.

- E. Make all submittals far enough in advance of scheduled dates for installation to provide all required time for reviews, for securing necessary approvals, for possible revision and resubmittal, and for placing orders and securing delivery. In scheduling, allow sufficient time for the Engineer's review following the receipt of the submittal. Coordinate submission of related items. For each submittal for review, allow 15-days excluding delivery time to and from the Contractor.
- F. Identify variations from Contract Documents and product or system limitations that may be detrimental to successful performance of the completed Work.
- G. Provide space for Contractor and Architect/Engineer review stamps.
- H. When revised for resubmission, identify all changes made since previous submission.
- I. Distribute copies of reviewed submittals as appropriate. Instruct parties to promptly report any inability to comply with requirements.

#### **1.4 CONSTRUCTION PROGRESS SCHEDULES**

- A. Submit initial schedule in duplicate within 15-days after date of Owner-Contractor Agreement.
- B. Revise and resubmit as required.
- C. ~~Submit a computer generated or horizontal bar chart with separate line for each major portion of Work or operation, identifying first work day of each week.~~
- D. Show complete sequence of construction by activity, identifying Work of separate stages and other logically grouped activities. Indicate the early and late start, early and late finish, float dates, and duration.
- E. Indicate estimated percentage of completion for each item of Work at each submission.
- F. Indicate submittal dates required for shop drawings, product data, samples, and product delivery dates, including those furnished by Owner and required by allowances.

#### **1.5 PRODUCT DATA**

- A. Product Data for Review:
  - 1. Submitted to Engineer for review and conformance with information given in specifications and the design concept expressed in contract documents.

2. After review, provide copies and distribute in accordance with SUBMITTAL PROCEDURES article above.
- B. Submit the number of copies Contractor and Owner require, plus two copies retained by Engineer.
- C. Mark each copy to identify applicable products, models, options, and other data. Supplement manufacturers' standard data to provide information specific to this Project.
- D. Indicate product utility and electrical characteristics, utility connection requirements, and location of utility outlets for service for functional equipment and appliances.
- E. After review, distribute in accordance with the Submittal Procedures article above.

## 1.6 SHOP DRAWINGS

- A. Contractor shall submit a minimum 5-copies of each shop drawing to the Engineer for review.
- B. Submitted to Engineer for review and conformance with information given in specifications and design concept expressed in contract documents. Review of shop drawings by Engineer shall not relieve Contractor of its responsibility for accuracy of shop drawings nor for furnishing of all materials and equipment required by the contract even though such items may not be indicated on shop drawings reviewed by Engineer.
- C. Shop drawings shall include applicable technical information, drawings, diagrams, performance curves, schedules, templates, calculations, instructions, measurements, and similar information as applicable to the specific item for which shop drawing is prepared.
- D. Do not use Engineer's Drawings for shop or erection purposes.
- E. Each shop drawing copy shall bear a Contractor's stamp showing they have been checked. Shop drawings submitted to the Engineer without Contractor's stamp will be returned to Contractor without review.

No review will be given to partial submittals of shop drawings for items which interconnect and/or are interdependent. It is the Contractor's responsibility to assemble shop drawings for all such interconnecting and/or interdependent items, check them and then make one submittal to Engineer.

Schedule of Submittals: Within 30-days of Contract award and prior to any shop drawing submittal, Contractor shall submit a schedule showing the estimated submittal date and desired acceptance date for each shop drawing anticipated. Time lost due to unacceptable submittals shall be the Contractor's responsibility.

## 1.7 SAMPLES

- A. Samples for Review:
  - 1. Submitted to Engineer for review and conformance with information given in specifications and design concept expressed in contract documents.
  - 2. After review, produce duplicates and distribute in accordance with SUBMITTAL PROCEDURES article above.
- B. Samples for Information:
  - 1. Submitted for Engineer's knowledge as contract administrator or for the Owner.
- C. Include identification on each sample, with full product information.
- D. Submit the number of samples specified in individual specification sections; one of which will be retained by Engineer.
- E. Reviewed samples which may be used in the Work are indicated in individual specification sections.
- F. Samples will not be used for testing purposes unless specifically stated in the specification section.

## 1.8 DESIGN DATA

- A. Submit for Engineer's knowledge as contract administrator or for the Owner.

- B. Submit for information and conformance with information given in specifications and design concept expressed in contract documents.

**REFERENCE ONLY**

## 1.9 TEST REPORTS

- A. Submit for Engineer's knowledge as contract administrator or for the Owner.
- B. Submit test reports for information and assessing conformance with information given in specifications and design concept expressed in contract documents.

## 1.10 CERTIFICATES

- A. When specified in individual specification sections, submit certification by manufacturer, installation/application subcontractor, or the Contractor to Engineer, in quantities specified for Product Data.
- B. Indicate material or product conforms to or exceeds specified requirements. Submit supporting reference data, affidavits, and certifications as appropriate.
- C. Certificates may be recent or previous test results on material or product but must be acceptable to Engineer.

**1.11 MANUFACTURER'S INSTRUCTIONS**

- A. When specified in individual specification sections, submit printed instructions for delivery, storage, assembly, installation, adjusting, and finishing, to Engineer for delivery to Owner in quantities specified for product Data.
- B. Indicate special procedures, perimeter conditions requiring special attention, and special environmental criteria required for application or installation.
- C. Refer to Section 01400 – Quality Control, Manufacturers' Field Services article.

**1.12 MANUFACTURER'S FIELD REPORTS**

- A. Submit reports for Engineer's benefit as contract administrator or for the Owner.
- B. Submit report in duplicate within 30-days of observation to Engineer for information.
- C. Submit for information and assessing conformance with information given in specifications and design concept expressed in contract documents.

**1.13 ERECTION DRAWINGS**

- A. Submit drawings for Engineer's benefit as contract administrator or for the Owner.
- B. Submit for information and assessing conformance with information given in specifications and design concept expressed in contract documents.
- C. Data indicating inappropriate or unacceptable Work may be subject to action by the Engineer or Owner.

**1.14 REVIEWED SHOP DRAWINGS**

- A. Engineer Review.
  - 1. Acceptable submittals will be marked "No Exceptions Taken." A minimum of three copies will be retained by the Engineer for Engineer's and Owner's use and remaining copies will be returned to Contractor.
  - 2. Submittals requiring minor corrections before the product is acceptable will be marked "Furnish as Corrected." Contractor may order, fabricate, and ship items included in submittals, provided the indicated corrections are made.
  - 3. Submittals marked "Revise and Resubmit" must be revised to reflect required changes and the initial review procedure repeated.
  - 4. The "Rejected" notation is used to indicate products not acceptable. Upon return of a submittal so marked, Contractor shall repeat the initial review procedure utilizing acceptable products.

5. Only two copies of items marked "Revise and Resubmit" and "Rejected" will be reviewed and marked. One copy will be retained by Engineer and the other copy with all remaining unmarked copies will be returned to Contractor for resubmittal.
- B. No Work or products shall be installed without a drawing or submittal bearing the "No Exceptions Taken" or "Furnish as Corrected" notation. Contractor shall maintain at the job site a complete set of shop drawings bearing Engineer's stamp.
- C. Substitutions: In the event Contractor obtains Engineer's acceptance for use of products other than those listed first in Contract Documents, Contractor shall, at Contractor's own expense and using methods accepted by Engineer, make any changes to structures, piping and electrical work necessary to accommodate these products.
- D. Use of "No Exceptions Taken" or "Furnish as Corrected" notation on shop drawings or other submittals is general and shall not relieve Contractor of the responsibility of furnishing products of proper dimension, size, quality, quantity, materials, all performance characteristics, and to efficiently perform requirements and intent of Contract Documents. Engineer's review shall not relieve Contractor of the responsibility of errors of any kind on shop drawings. Review is intended only to assure conformance with design concept of the project and compliance with information given in Contract Documents.

### 1.15 SUBMITTAL CHECKLIST

- A. This checklist is not necessarily complete. Contractor is responsible to submit all items and materials as specified in each section.

Section	Submittal	Date Received by T & H	Accepted Submittal Returned to Owner/Contractor	Submittal Rejected & Returned	Comments
<b>02210 – Soil Erosion Control</b>					
	Silt Fence				
	Temporary Porous Baffles				
	Temporary Floating Skimmers				
<b>02231 – Aggregate Base Course</b>					
	Aggregate				
	Prime				
<b>02275 – Rip-Rap</b>					
	Stone				

Section	Submittal	Date Received by T & H	Accepted Submittal Returned to Owner/Contractor	Submittal Rejected & Returned	Comments
	Filter Fabric				
<b>02512 – Asphaltic Concrete Binder/Surface Courses</b>					
	Tack Coat				
	Asphalt Cement				
	Anti-Stripping Agent				
	Mix Designs				
<b>02667 – Water Distribution System</b>					
	PVC Pipe – 4"Ø and Larger				
	Fittings – PVC				
	Gate Valve				
	Air Release Valve				
	Valve Box				
	Valve Box Collar				
	Hydrant Tee				
	Fire Hydrant				
	Restrained Joint Fittings				
	Tracing Wire				
<b>02720 – Storm Drainage</b>					
	Reinforced Concrete Pipe				
	Gaskets				
	Drainage Structures				

Section	Submittal	Date Received by T & H	Accepted Submittal Returned to Owner/Contractor	Submittal Rejected & Returned	Comments
	Frames, Covers & Grates				
	Filter Fabric				
	Tracing Wire				
<b>02731 – Wastewater Collection System</b>					
	Manholes & Interior Coating				
	Joint Wrap				
	Joint Sealant				
	Steps				
	Piping – PVC – Gravity				
	Frames & Covers				
	Tracing Wire				
	Magnetic Tape				
<b>02902 – Grassing</b>					
	Seed Mix – Temporary				
	Seed Mix – Permanent				
	Fertilizer				
	Lime				
<b>03305 – Site Concrete</b>					
	Mix Design				
	Curing Compounds				
	Joint Filler				
	Reinforcing Steel				

Section	Submittal	Date Received by T & H	Accepted Submittal Returned to Owner/Contractor	Submittal Rejected & Returned	Comments
	Welded Wire Fabric				
	Dowels				
	Fiber Reinforcement				

**PART 2 – PRODUCTS**

Not Used.

**PART 3 – EXECUTION**

Not Used.

**END OF SECTION****REFERENCE ONLY**

**INDEX TO**  
**SECTION 01400 – QUALITY CONTROL**

<b>Paragraph</b>	<b>Title</b>	<b>Page</b>
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1.4	Tolerance	01400-1
1.5	References and Standards	01400-2
1.6	Testing Services	01400-2
1.7	Manufacturer's Field Services	01400-3
<b>PART 2 – PRODUCTS</b>		
	Not Used	
<b>PART 3 – EXECUTION</b>		
3.1	Examination	01400-3
3.2	Preparation	01400-3

**REFERENCE ONLY**

**SECTION 01400**  
**QUALITY CONTROL**

**PART 1 – GENERAL**

**1.1 SECTION INCLUDES**

- A. Quality assurance - control of installation.
- B. Tolerances
- C. References and standards.
- D. Testing laboratory services.
- E. Manufacturer's field services.

**1.2 RELATED SECTIONS**

- A. Section 01300 - Submittals: Submission of manufacturer's instructions and certificates.
- B. Section 01410 - Testing Services.

**1.3 QUALITY ASSURANCE - CONTROL OF INSTALLATION**

- A. Monitor quality control over suppliers, manufacturers, products, services, site conditions, and workmanship, to produce Work of specified quality.
- B. Comply with manufacturer's instructions, including each step-in sequence.
- C. Should manufacturer's instructions conflict with Contract Documents, request clarification from Engineer before proceeding.
- D. Comply with specified standards as minimum quality for the Work except where more stringent tolerances, codes, or specified requirements indicate higher standards or more precise workmanship.
- E. Perform Work by persons qualified to produce required and specified quality.
- F. Verify field measurements are as indicated on shop drawings or as instructed by the manufacturer.
- G. Secure products in place with positive anchorage devices designed and sized to withstand stresses, vibration, physical distortion, or disfigurement.

**1.4 TOLERANCES**

- A. Monitor fabrication and installation tolerance control of products to produce acceptable Work. Do not permit tolerances to accumulate.

- B. Comply with manufacturer's tolerances. Should manufacturer's tolerances conflict with Contract Documents, request clarification from Architect/Engineer before proceeding.
- C. Adjust products to appropriate dimensions and position before securing in place.
- D. Accessible routes shall not exceed maximum ADA allowable slopes.

#### 1.5 REFERENCES AND STANDARDS

- A. For products or workmanship specified by association, trade, or other consensus standards, complies with requirements of the standard, except when more rigid requirements are specified or are required by applicable codes.
- B. Conform to reference standard by date of issue current with date specified in the individual specification sections, except where a specific date is established by code.
- C. Obtain copies of standards where required by product specification sections.
- D. Neither the contractual relationships, duties, nor responsibilities of the parties in Contract or those of the Architect/Engineer shall be altered from the Contract Documents by mention or inference otherwise in any reference document.

#### 1.6 TESTING SERVICES

- A. Owner will appoint, employ, and pay for specified services of an independent firm to perform testing. Contractor shall pay for all retesting of failed tests.
- B. The independent firm will perform tests and other services specified in individual specification sections and as required by the Owner.
- C. Testing and source quality control may occur on or off the project site. Perform off-site testing as required by the Owner.
- D. Reports will be submitted by the independent firm to the Engineer and Contractor, in duplicate, indicating observations and results of tests and indicating compliance or non-compliance with Contract Documents.
- E. Cooperate with independent firm; furnish samples of materials, design mix, equipment, tools, storage, safe access, and assistance by incidental labor as requested.
  - 1. Notify Architect/Engineer and independent firm 48 hours prior to expected time for operations requiring services.
  - 2. Make arrangements with independent firm and pay for additional samples and tests required for Contractor's use.
- F. Testing does not relieve Contractor to perform Work to contract requirements.

- G. Re-testing required because of non-conformance to specified requirements shall be performed by the same independent firm on instructions by the Engineer. Payment for re-testing will be made by the Contractor.

## **PART 2 – PRODUCTS**

Not Used

## **PART 3 – EXECUTION**

### **3.1 EXAMINATION**

- A. Verify existing site conditions and substrate surfaces are acceptable for subsequent Work. Beginning new Work means acceptance of existing conditions.
- B. Verify existing substrate is capable of structural support or attachment of new Work being applied or attached.
- C. Examine and verify specific conditions described in individual specification sections.
- D. Verify utility services are available, of the correct characteristics, and in the correct locations.

### **3.2 PREPARATION**

- A. Clean substrate surfaces prior to applying next material or substance.
- B. Seal cracks or openings of substrate prior to applying next material or substance.
- C. Apply manufacturer required or recommended substrate primer, sealer, or conditioner prior to applying any new material or substance in contact or bond.

**REFERENCE ONLY**

**END OF SECTION**

**INDEX TO**  
**SECTION 01410 - TESTING SERVICES**

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1.4	Selection and Payment	01410-2
1.5	Quality Assurance	01410-2
1.6	Contractor Submittal	01410-2
1.7	Testing Agency Responsibilities	01410-3
1.8	Testing Agency Reports	01410-3
1.9	Limits on Testing Authority	01410-3
1.10	Contractor Responsibilities	01410-4
1.11	Schedule of Tests	01410-4

**PART 2 – PRODUCTS**

Not Used.

**PART 3 – EXECUTION**

Not Used.

**REFERENCE ONLY**

**SECTION 01410**  
**TESTING SERVICES**

**PART 1 – GENERAL**

**1.1 SECTION INCLUDES**

- A. Selection and payment.
- B. Contractor submittals.
- C. Testing agency responsibilities.
- D. Testing agency reports.
- E. Limits on testing authority.
- F. Contractor responsibilities.
- G. Schedule of tests.

**1.2 RELATED SECTIONS**

- A. Testing and approvals required by public authorities.
- B. Section 01300 – Submittals: Manufacturer's certificates.
- C. Section 01400 – Quality Control.
- D. Section 01702 – Contract Closeout: Project record documents.

**1.3 REFERENCES (LATEST REVISION)**

- A. ASTM C 802 – Practice for Conducting an Interlaboratory Test Program to Determine the Precision of Test Methods for Construction Materials.
- B. ASTM C 1077 – Practice for Laboratories Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Laboratory Evaluation.
- C. ASTM C 1093 – Practice for Accreditation of Testing Agencies for Masonry.
- D. ASTM D 3740 – Practice for Minimum Requirements for Agencies Engaged in Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction.
- E. ASTM D 4561 – Practice for Quality Control Systems for Organizations Producing and Applying Bituminous Paving Materials.
- F. ASTM E 329 – Specification for Agencies Engaged in Construction Inspection and/or Testing.

**REFERENCE ONLY**

- G. ASTM E 543 – Practice for Agencies Performing Nondestructive Testing.
- H. ASTM E 548 – Guide for General Criteria Used for Evaluating Laboratory Competence.
- I. ASTM E 699 – Practice for Evaluation of Agencies Involved in Testing, Quality Assurance, and Evaluating of Building Components.

#### **1.4 SELECTION AND PAYMENT**

- A. Owner will employ and pay for services of an independent testing agency or laboratory to perform specified testing. Contractor shall pay for all retesting of failed tests.
- B. Employment of testing agency or laboratory in no way relieves Contractor of obligation to perform Work in accordance with requirements of Contract Documents.

#### **1.5 QUALITY ASSURANCE**

- A. Comply with requirements of practices listed in paragraph 1.3.
- B. Laboratory: Authorized to operate in State in which project is located.
- C. Laboratory Staff: Maintain a full-time registered Engineer on staff to review services.
- D. Testing Equipment: Calibrated at reasonable intervals with devices of an accuracy traceable to either National Bureau of Standards or accepted values of natural physical constants.

#### **1.6 CONTRACTOR SUBMITTALS**

- A. Prior to start of Work, submit testing laboratory name, address, and telephone number, and names of full-time registered Engineer and responsible officer.
- B. Submit copy of report of laboratory facilities inspection made by Materials Reference Laboratory of National Bureau of Standards during most recent inspection, with memorandum of remedies of any deficiencies reported by the inspection.

#### **1.7 TESTING AGENCY RESPONSIBILITIES**

- A. Test samples of mixes submitted by Contractor.
- B. Provide qualified personnel at site. Cooperate with Engineer and Contractor in performance of services.
- C. Perform specified sampling and testing of products in accordance with specified standards.
- D. Ascertain compliance of materials and mixes with requirements of Contract Documents.

- E. Promptly notify Engineer and Contractor of observed irregularities or non-conformance of Work or products.
- F. Perform additional tests required by Engineer.
- G. Attend preconstruction meetings and progress meetings.

### 1.8 TESTING AGENCY REPORTS

- A. After each test, promptly submit two copies of report to Engineer and to Contractor.
- B. Include:
  - 1. Date issued.
  - 2. Project title and number.
  - 3. Name of inspector.
  - 4. Date and time of sampling or inspection.
  - 5. Identification of product and specifications section.
  - 6. Location in the Project.
  - 7. Type of inspection or test.
  - 8. Date of test.
  - 9. Results of tests.
  - 10. Conformance with Contract Documents.
- C. When requested by Engineer, provide interpretation of test results.

### 1.9 LIMITS ON TESTING AUTHORITY

- A. Agency or laboratory may not release, revoke, alter, or enlarge on requirements of Contract Documents.
- B. Agency or laboratory may not approve or accept any portion of the Work.
- C. Agency or laboratory may not assume any duties of Contractor.
- D. Agency or laboratory has no authority to stop the Work.

### 1.10 CONTRACTOR RESPONSIBILITIES

- A. Deliver to agency or laboratory at designated location, adequate samples of materials proposed to be used requiring testing, along with proposed mix designs.
- B. Cooperate with laboratory personnel and provide access to the work and to manufacturer's facilities.
- C. Provide incidental labor and facilities:
  - 1. To provide access to Work to be tested.
  - 2. To obtain and handle samples at the site or at source of products to be tested.
  - 3. To facilitate tests.
  - 4. To provide storage and curing of test samples.

- D. Notify Engineer and laboratory 48-hours prior to expected time for operations requiring testing services.

### 1.11 SCHEDULE OF TESTS

Section	Test	Frequency	Date	Performed By	Notes
<b>02204 – Earthwork</b>					
	Compaction				
	Unpaved	1 test per horizontal layer per 10,000 sf of fill area			
	Paved	1 test per horizontal layer per 5,000 sf of subgrade			
	Curb & gutter	1 test per 300 lf			
	Proof Rolling	As necessary			
<b>02231 – Aggregate Base Course</b>					
	Base Density	1 test per 5,000 sf			
<b>02512 – Asphaltic Concrete Binder/Surface courses</b>					
	Asphalt Extraction & Gradation	1 test for each 250 tons placed			
	Marshall Stability	1 test for each 250 tons placed			
	Field Density	1 test for each 250 tons placed			
	Cores	1 test for each 250 tons placed			
<b>02667 – Water Distribution System</b>					
	Hydrostatic & Leakage	1.5 times the working pressure (no less than 150 psi). Conducted for 2 hours with maintained pressure of 150 psi (200 psi on fire main)			
	Bacteriological Samples	2 taken 24 hours apart after disinfection			
	Compaction				
	Traffic Areas	1 per 100 lf or less for each 4 ft. of depth			
	Non-Traffic Areas	1 per 500 lf or less for each 4 ft. of depth			
	Fire Flow	1 per permit			
<b>02720 – Storm Drainage</b>					
	Compaction				
	Traffic Areas	1 per 100 lf or less for each 4 ft. of depth			
	Non-Traffic	1 per 500 lf or less for each 6 ft. of depth			
<b>02731 – Wastewater Collection System</b>					

Section	Test	Frequency	Date	Performed By	Notes
	Certification	Completion			
	Warranty	Completion			
	Television Inspection of Sewers	As requested			
	Leakage	As necessary			
	Compaction				
	Traffic Areas	1 per 100 lf or less for each 4 ft. of depth			
	Non-Traffic Areas	1 per 500 lf or less for each 6 ft. of depth			
	Gravity – Air	[ All lines]			
	Deflection	10% of system			
<b>03305 – Site Concrete</b>					
	Mix Designs	1 per mix design			
	Compressive Strength	3 test cylinders for every 50 cubic yards or less of each mix design placed daily			
		1 cylinder broken at 7 days			
		2 cylinders broken at 28 days			
	Slump	1 test for each set of cylinders taken			

**PART 2 – PRODUCTS**

Not Used.

**REFERENCE ONLY****PART 3 – EXECUTION**

Not Used.

**END OF SECTION**

**INDEX TO**  
**SECTION 01702 – CONTRACT CLOSEOUT**

<b>Paragraph</b>	<b>Title</b>	<b>Page</b>
<b>PART 1 – GENERAL</b>		
1.1	Section Includes	01702-1
1.2	Related Sections	01702-1
1.3	Closeout Procedures	01702-1
1.4	Final Cleaning	01702-1
1.5	Adjusting	01702-2
1.6	Project Record Documents	01702-2
1.7	Operation and Maintenance Data	01702-3
1.8	Spare Parts and Maintenance Products	01702-4
1.9	Warranties and Bonds	01702-4
1.10	Maintenance Service	01702-4

**PART 2 – PRODUCTS**

Not Used

**PART 3 – EXECUTION**

Not Used

3.1  
**REFERENCE ONLY**

**SECTION 01702**  
**CONTRACT CLOSEOUT**

**PART 1 – GENERAL**

**1.1 SECTION INCLUDES**

- A. Closeout procedures.
- B. Project record documents.
- C. Operation and maintenance data.
- D. Warranties and bonds.
- E. Maintenance service.

**1.2 RELATED SECTIONS**

- A. Section 01300 - Submittals
- B. Warranties.
- C. Bonds.

**1.3 CLOSEOUT PROCEDURES**

- A. Submit written verification Contract Documents being reviewed, Work has been observed at appropriate times, and Work is complete in accordance with Contract Documents and ready for Engineer's review.
- B. Provide submittals to Engineer required by governing or other authorities.
- C. Submit final Application for Payment identifying total adjusted Contract Sum, previous payments, and sum remaining due.

**1.4 FINAL CLEANING**

- A. Execute final cleanup prior to final project assessment.
- B. Remove waste and surplus materials, rubbish, and construction facilities from the site.

**1.5 ADJUSTING**

- A. Adjust operating products and equipment to ensure smooth and unhindered operation.

## 1.6 PROJECT RECORD DOCUMENTS

- A. Maintain on site one set of the following record documents; record actual revisions to the Work:
1. Drawings.
  2. Specifications.
  3. Addenda.
  4. Change Orders and other modifications to the Contract.
  5. Reviewed Shop Drawings, Product Data, and Samples.
  6. Manufacturer's instruction for assembly, installation, and adjusting.
- B. Ensure entries are complete and accurate, enabling future reference by Owner.
- C. Store record documents separate from documents used for construction.
- D. Record information concurrent with construction progress.
- E. Equipment Specifications: Legibly mark and record at each product section description of actual products installed, including the following:
1. Manufacturer's name and product model and number.
  2. Product substitutions or alternates utilized.
  3. Changes made by Addenda and modifications.
- F. Project Record Drawings: Legibly mark each item to record actual construction including:
1. Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements.
  2. Measured locations of internal utilities and appurtenances concealed in construction, referenced to visible and accessible features of the Work.
  3. Where proposed and existing utilities cross, the Contractor shall measure and record the horizontal location and vertical separation between each crossing. Separation shall be measured between exteriors and pipes.
  4. Field changes of dimension and detail.
  5. Details not on original Contract drawings.
  6. Piling data locations, tip and cut-off elevations, and driving records.
- G. Submit documents to Engineer with claim for final Application for Payment.

## PART 2 – PRODUCTS

Not Used

## PART 3 – EXECUTION

Not Used

**END OF SECTION**

**INDEX TO**  
**SECTION 02070 - SELECTIVE DEMOLITION**

<b>Paragraph</b>	<b>Title</b>	<b>Page</b>
<b>PART 1 – GENERAL</b>		
1.1	Related Documents	02070-1
1.2	Description of Work	02070-1
1.3	Submittals	02070-1
1.4	Job Conditions	02070-1
1.5	Damages	02070-1
1.6	Traffic	02070-1
1.7	Explosives	02070-2
1.8	Utility Services	02070-2
1.9	Environmental Controls	02070-2
1.10	Measurement and Payment	02070-2
<b>PART 2 – PRODUCTS</b>		
	None this Section	
<b>PART 3 – EXECUTION</b>		
3.1	Preparation	02070-2
3.2	Demolition	02070-3
3.3	Salvage Materials	02070-3
3.4	Disposal of Demolished Materials	02070-3
3.5	Clean-up and Repair	02070-3

**REFERENCE ONLY**

**SECTION 02070****SELECTIVE DEMOLITION****PART 1 – GENERAL****1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions apply to work of this section.

**1.2 DESCRIPTION OF WORK**

- A. Extent of selective demolition work is indicated on drawings.

**1.3 SUBMITTALS**

- A. Schedule: Submit schedule indicating proposed methods and sequence of operations for selective demolition work to Owner's representative for review prior to commencement of work. Include coordination for shut-off, capping, and continuation of utility services as required, together with details for dust and noise control protection. Include schedule and location for return of items identified on plans to be delivered to Owner of property.

**1.4 JOB CONDITIONS**

- A. Condition of Structures: Owner assumes no responsibility for actual condition of items to be demolished.

- B. ~~Partial Demolition and Removal: Items indicated to be removed but of value to Contractor may be removed as work progresses. Transport salvaged items from site as they are removed.~~

Storage or sale of removed items on site will not be permitted.

- C. Protections: Provide temporary barricades and other forms of protection as required to protect Owner's personnel and general public from injury due to selective demolition work.

Protect from damage existing finish work to remain in place and becomes exposed during demolition operations. Remove protections at completion of work.

**1.5 DAMAGES**

- A. Promptly repair damages caused to adjacent facilities by demolition work at no cost to Owner.

**1.6 TRAFFIC**

- A. Conduct selective demolition operations and debris removal in a manner to ensure minimum interference with roads, streets, walks, and other adjacent occupied or used facilities.

Do not close, block or otherwise obstruct streets, walks, or other occupied or used facilities without written permission from authorities having jurisdiction. Provide alternate routes around closed or obstructed traffic ways.

### **1.7 EXPLOSIVES**

- A. Use of explosives will not be permitted.

### **1.8 UTILITY SERVICES**

- A. Maintain existing utilities indicated to remain, keep in service, and protect against damage during demolition operations.

Do not interrupt existing utilities serving occupied or used facilities, except when authorized in writing by authorities having jurisdiction. Provide temporary services during interruptions to existing utilities, as acceptable to governing authorities.

### **1.9 ENVIRONMENTAL CONTROLS**

- A. Use water sprinkling, temporary enclosures, and other suitable methods to limit dust and dirt rising and scattering in air to lowest practical level. Comply with governing regulations pertaining to environmental protection.

Do not use water when it may create hazardous or objectionable conditions such as ice, flooding, and pollution.

### **1.10 MEASUREMENT AND PAYMENT**

- A. There will be no measurement for selective demolition. Payment will be made at the contract lump sum price. Payment will include equipment, labor, materials, protection, clean-up, disposal, and all work necessary to complete the selective demolition shown on the construction drawings.

## **PART 2 – PRODUCTS**

None in this section

## **PART 3 – EXECUTION**

### **3.1 PREPARATION**

- A. Prior to commencement of selective demolition work, check areas in which work will be performed. Photograph or video existing conditions of surfaces, equipment, or surrounding properties that could be misconstrued as damage resulting from selective demolition work. File with Owner's representative prior to starting work.

- B. Cover and protect equipment and fixtures to remain from soiling or damage when demolition work is performed in areas from which such items have not been removed.

### 3.2 DEMOLITION

- A. Perform selective demolition work in a systematic manner. Use such methods as required to complete work indicated on drawings in accordance with demolition schedule and governing regulations.

Demolish concrete in small sections. Cut concrete at junctures with construction to remain using power-driven masonry saw or hand tools. Do not use power-driven impact tools.

Completely fill below-grade areas and voids resulting from demolition work. Provide fill consisting of approved earth, gravel and sand, free of trash and debris, stones over 2" diameter, roots or other organic matter.

If unanticipated mechanical, electrical, or structural elements, which conflict with intended function or design, are encountered, investigate and measure both nature and extent of the conflict. Submit report to Owner's representative in written, accurate detail. Pending receipt of directive from Owner's representative, rearrange selective demolition schedule as necessary to continue overall job progress without delay.

### 3.3 SALVAGE MATERIALS

- A. Any articles of historic significance will remain the property of the Owner. Notify Owner's representative if such items are encountered and obtain acceptance regarding method of removal and salvage for Owner.

### 3.4 DISPOSAL OF DEMOLISHED MATERIALS

- A. Remove debris, rubbish and other materials resulting from demolition operations from site. Transport and legally dispose of materials off site.

If hazardous materials are encountered during demolition operations, comply with applicable regulations, laws, and ordinances concerning removal, handling, and protection against exposure or environmental pollution.

Burning of removed materials is not permitted on project site.

### 3.5 CLEAN-UP AND REPAIR

- A. Upon completion of demolition work, remove tools, equipment and demolished materials from site. Remove protections and leave site clean.

Repair demolition performed in excess of required work. Return structures and surfaces to remain to the condition existing prior to commencement of selective demolition work. Repair adjacent construction or surfaces soiled or damaged by selective demolition work.

Fill in all voids created by selective demolition and grade site to drain. Grass all disturbed areas for erosion control.

**END OF SECTION**

**REFERENCE ONLY**

**INDEX TO**  
**SECTION 02110 – SITE CLEARING**

<b>Paragraph</b>	<b>Title</b>	<b>Page</b>
<b>PART 1 – GENERAL</b>		
1.1	Section Includes	02110-1
1.2	Related Sections	02110-1
1.3	Measurement and Payment	02110-1
1.4	Regulatory Requirements	02110-1
<b>PART 2 – PRODUCTS</b>		
2.1	Materials	02110-1
<b>PART 3 – EXECUTION</b>		
3.1	Preparation	02110-2
3.2	Protection	02110-2
3.3	Clearing	02110-3
3.4	Removal	02110-3
3.5	Disposal	02110-3
3.6	Grubbing	02110-4

**REFERENCE ONLY**

**SECTION 02110****SITE CLEARING****PART 1 – GENERAL****1.1 SECTION INCLUDES**

- A. Removal of surface debris.
- B. Removal of paving and storm culverts.
- C. Removal of trees, shrubs, and other plant life.
- D. Topsoil excavation.

**1.2 RELATED SECTIONS**

- A. Section 02070 – Selective Demolition.
- B. Section 02204 - Earthwork.

**1.3 MEASUREMENT AND PAYMENT**

- A. Measurement and payment for site clearing shall be made at the contract unit price. Work includes clearing site, removing trees and stumps, loading and removing waste materials from site.

**1.4 REGULATORY REQUIREMENTS**

- A. Conform to applicable codes for environmental requirements, disposal of debris, use of herbicides, and demolition as required.
- B. Coordinate clearing Work with utility companies.
- C. There will be no burning of allowed.

**PART 2 – PRODUCTS****2.1 MATERIALS**

OMITTED

**PART 3 – EXECUTION****3.1 PREPARATION**

- A. Identify an off-site salvage area for placing removed materials.

### 3.2 PROTECTION

- A. Protect benchmarks, survey control points, and existing structures from damage or displacement.
- B. Protect all remaining utilities.
- C. Clearing operations shall be conducted to prevent damage by falling trees to trees left standing, to existing structures and installations, and to those under construction, and to provide for the safety of employees and others.

### 3.3 CLEARING

- A. Clear areas required for access to site and execution of work. Clearing shall consist of felling and cutting trees into sections, and satisfactory disposal of trees and other vegetation designated for removal, including downed timber, snags, brush, and rubbish occurring within area to be cleared. Trees, stumps, roots, brush, and other vegetation in areas to be cleared shall be removed completely from the site, except such trees and vegetation as may be indicated or directed to be left standing. Trees designated to be left standing within cleared areas shall be trimmed of dead branches 1-1/2 inch or more in diameter. Limbs and branches to be trimmed shall be neatly cut close to the trunk of the tree or main branches. Cuts more than 1-1/2 inches in diameter shall be painted with an accepted treewound paint. Trees and vegetation to be left standing shall be protected from damage incident to clearing, grubbing, and construction operations, by the erection of timber barriers or by such other means as circumstances require. Such barriers must be placed and be checked by the OWNER before construction observations can proceed (See 3.2). Clearing shall also include removal and disposal of structures obtruding, encroaching upon, or otherwise obstructing the work.

### 3.4 REMOVAL

- A. Where indicated or directed, trees and stumps shall be removed from areas outside those areas designated for clearing and grubbing. Work shall include felling of such trees and removal of their stumps and roots. Trees shall be disposed of as hereinafter specified.
- B. Remove debris, rock, and other extracted plant life from site.
- C. Partially remove paving, curbs, and storm culverts as indicated. Neatly saw cut edges at right angle to surface.

### 3.5 DISPOSAL

- A. Disposal of trees, branches, snags, brush, stumps, etc., resulting from clearing and grubbing shall be the Contractor's responsibility and shall be disposed of by removal from site. Disposal by burning will not be allowed. Contractor shall be responsible for compliance with all local and State laws and regulations relative to the disposal of cleared debris. All liability of any nature resulting from disposal of cleared and grubbed material shall become the Contractor's responsibility.

Disposal of all materials cleared and grubbed will be in accordance with rules and regulations of the State of South Carolina.

### **3.6 GRUBBING**

- A. Grubbing shall consist of removal and disposal of stumps, roots larger than one inch in diameter, and matted roots from designated grubbing areas. This material, together with logs and other organic or metallic debris not suitable for building of pavement subgrade or building pads, shall be excavated, and removed to a depth of not less than 18-inches below original surface level of the ground in embankment areas and not less than 2-feet below finished earth surface in excavated areas. Depressions made by grubbing shall be filled with suitable material and compacted to make the surface conform to original adjacent ground. There will be no measurement or payment for this suitable material replacement and shall be included within the unit price for site clearing.

**END OF SECTION**

**REFERENCE ONLY**

**INDEX TO**  
**SECTION 02111 – SITE PREPARATION**

<b>Paragraph</b>	<b>Title</b>	<b>Page</b>
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1.2	Related Requirements	02111-1
1.3	Protections	02111-1
<b>PART 2 – PRODUCTS</b>		
	Not Used	
<b>PART 3 – EXECUTION</b>		
3.1	Clearing or Removal of Trees and Other Vegetation	02111-2

**REFERENCE ONLY**

**SECTION 02111**  
**SITE PREPARATION**

**Paragraph**

**PART 1 – GENERAL**

**1.1 SUMMARY**

- A. Section Includes:
  - 1. Protection or removal of trees and other vegetation.
  - 2. Topsoil stripping.
  - 3. Clearing and grubbing.
  - 4. Erosion control.

**1.2 RELATED REQUIREMENTS**

- A. Construction Drawings
- B. Section 02070 – Selective Demolition
- C. Section 02210 – Site Clearing

**1.3 PROTECTIONS**

- A. Provide protection necessary to prevent damage to existing improvements, trees, or vegetation indicated on the Contract Documents to remain.
- B. Protect improvements on adjoining properties and on Owner's property.
- C. Restore damaged improvements to original condition as acceptable to parties having jurisdiction.
- D. Conduct operations to ensure minimum interference with roads, streets, walks, and other adjacent occupied or used facilities. Do not close or obstruct streets, walks, or other occupied or used facilities without permission from authorities having jurisdiction and from Owner. Streets and roadways shall be thoroughly cleaned and/or swept on a daily basis or more frequently as required by the governing authority.
- E. Provide traffic control as required, in accordance with the U.S. Department of Transportation "Manual of Uniform traffic Control Devices" and the state highway department requirements.
- F. Provide necessary erosion control measures to prevent siltation of existing pavement or storm drainage facilities to remain.

**REFERENCE ONLY**

**PART 2 – PRODUCTS**

Not Used

**PART 3 – EXECUTION****3.1 CLEARING AND REMOVAL OF TREES AND OTHER VEGETATION**

- A. Unless otherwise indicated on the drawings, remove trees, shrubs, grass, other vegetation, improvements, or obstructions interfering with installation of new construction within the limits of work. Removal includes digging out stumps and roots. Do not remove items elsewhere on site or premises unless specifically indicated.
- B. Strip topsoil to whatever depths encountered to prevent intermingling with underlying subsoil or other objectionable material. Cut heavy growths of grass from areas before stripping. Topsoil shall consist of sandy clay surficial soil found in depth of not less than 6-inches. Satisfactory topsoil is reasonably free of subsoil, clay lumps, stones and other objects over 2-inches in diameter, weeds, roots, and other objectionable material.
- C. Stockpile topsoil in storage piles in areas shown or where directed. Construct storage piles to freely drain surface water. Cover storage piles if required to prevent windblown dust. Dispose of unsuitable or excess topsoil same as specified for waste material, unless otherwise specified by Owner.
- D. Completely remove stumps, roots, and other debris below proposed subgrade elevation. Fill depressions caused by clearing and grubbing operations with satisfactory soil material, unless further excavation or earthwork is required. Place fill material in horizontal layers not exceeding 8-inches loose depth, and thoroughly compacted per fill requirements of this section.
- E. Remove existing above grade and below grade improvements and abandoned underground piping or conduit necessary to permit construction and other work.

**END OF SECTION**

**INDEX TO**  
**SECTION 02204 – EARTHWORK**

<b>Paragraph</b>	<b>Title</b>	<b>Page</b>
<b>PART 1 – GENERAL</b>		
1.1	Section Includes	02204-1
1.2	Related Sections	02204-1
1.3	Measurement and Payment	02204-1
1.4	References	02204-2
1.5	Submittals	02204-2
1.6	Quality Assurance	02204-3
1.7	Testing	02204-3
<b>PART 2 – PRODUCTS</b>		
2.1	Materials	02204-3
2.2	Source Quality Control	02204-4
<b>PART 3 – EXECUTION</b>		
3.1	Topsoil	02204-4
3.2	Excavation	02204-4
3.3	Ground Surface Preparation for Fill	02204-5
3.4	Fill	02204-5
3.5	Finished Grading	02204-5
3.6	Disposal of Waste Material	02204-6
3.7	Protection	02204-6
3.8	Drainage	02204-7
3.9	Field Quality Control	02204-7
3.10	Proof Rolling	02204-7

**REFERENCE ONLY**

**SECTION 02204****EARTHWORK****PART 1 – GENERAL****1.1 SECTION INCLUDES**

- A. Grading
- B. Excavation
- C. Backfilling
- D. Compaction
- E. Remove and Replace Topsoil
- F. Dressing of Shoulders and Banks
- G. Stone Drainage Filter
- H. Water Control
- I. Testing

**1.2 RELATED SECTIONS**

- A. Section 01012 – Soil Investigation for Bidders
- B. Section 01400 – Quality Control
- C. Section 01410 – Testing Services
- D. Section 02070 – Selective Demolition
- E. Section 02110 – Site Clearing

**1.3 MEASUREMENT AND PAYMENT**

- A. Measurement and payment for earthwork will be made at the lump sum contract price. Work includes grading to subgrades, construction of ditches, dressing of disturbed areas, removing, and replacing topsoil, excavating, backfilling and compacting to required elevations, testing, staking, and construction supervision shall be included in the contract lump sum price for “Earthwork.”
- B. Unsuitable Material – All material encountered on-site is considered as unclassified. Thus, there will be no measurement made for the removal and replacement of unsuitable material, including rock excavation and removal. Payment for all earthwork material shall be included in the lump sum contract price for “Earthwork.”

- C. Borrow – There will be no measurement made for borrow. Payment for borrow shall be included in the lump sum contract price for “Earthwork.”
- D. Earthwork - All earthwork associated with the installation of bulkheads, headwalls, wingwalls, weir structures, drainage filters, rip-rap, etc. shall not be measured for direct payment. Payment for the earthwork shall be included in the lump sum contract price for “Earthwork.”
- E. Dewatering - No direct payment shall be made for dewatering. Dewatering shall be included in the item to which it pertains.
- F. Proof Rolling - No direct payment shall be made for proof rolling. Proof rolling shall be included in the contract unit price for earthwork.

#### **1.4 REFERENCES (LATEST REVISION)**

- A. ASTM D 448 – Sizes of Aggregate for Road and Bridge Construction.
- B. ASTM D 1557 – Laboratory Compaction Characteristics of Soil Using Modified Effort.
- C. ASTM D 2487 – Classification of Soils for Engineering Purposes (Unified Soil Classification System).
- D. ASTM D 6938 – In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth).
- E. ASTM D 3740 – Minimum Requirements for Agencies Engaged in Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction.
- F. ASTM E 329 – Agencies Engaged in Construction Inspection and/or Testing.

#### **1.5 SUBMITTALS**

- A. Section 01300 - Submittals: Procedures for submittals.
- B. Materials Source: Submit gradation analysis, proctor results, and soil classification for all borrow material.

#### **1.6 QUALITY ASSURANCE**

- A. Perform work in accordance with SCDOT, SCDHEC, and Florence County standards.

#### **1.7 TESTING**

- A. Laboratory tests for moisture density relationship for fill materials shall be in accordance with ASTM D 1557, (Modified Proctor).
- B. In place density tests in accordance with ASTM D 6938.

- C. Testing laboratory shall operate in accordance with ASTM D 3740 and E 329 and be acceptable to the Engineer.
- D. The testing laboratory and Project Engineer/Project Representative shall be given a minimum of 48-hours' notice prior to taking any of the tests.
- E. Owner shall select and engage the testing laboratory. Testing laboratory shall be responsible to the Owner and Owner's Engineer. Payment for laboratory and all tests shall be by the Owner, except Owner specifically reserves the right to deduct from Contractor's payment, expenses and charges of testing laboratory when:
  - 1. Contractor gives notice the work is ready for inspection and testing, and fails to be ready for the test, and/or
  - 2. Testing of the Contractor's work, products or materials fail, and retesting is required, and/or
  - 3. Contractor abuses the services or interferes with the work of the testing laboratory in the conduct of this work.
- F. Test results shall be furnished to the Engineer prior to continuing with associated or subsequent work.

## **PART 2 – PRODUCTS**

### **2.1 MATERIALS**

- A. Borrow shall consist of sand or sand-clay soils capable of being readily shaped and compacted to the required densities, and shall be reasonably free of roots, trash, rock larger than 2-inches, and other deleterious material.
- B. Recommend that new fill consist of imported select fill. Imported fill soils that are used to build up the ground for pavements should meet the following minimum requirements: plasticity index of 15 percent or less; clay/silt fines content of not greater than 35 percent passing the No. 200 sieve; natural moisture content within plus or minus 2 percent of the optimum moisture content at the time of delivery.. Perform work in accordance with South Carolina Department of Transportation Standard Specifications for Highway Construction – Section 203, latest edition.
- C. Contractor shall furnish all borrow material.
- D. Contractor shall be responsible for and bear all expenses in developing borrow sources including securing necessary permits, drying the material, haul roads, clearing, grubbing, excavating the pits, placing, compaction and restoration of pits and haul roads to a condition satisfactory to property owners and in compliance with applicable federal, state, and local laws and regulations.

### **2.2 SOURCE QUALITY CONTROL**

- A. If tests indicate materials do not meet specified requirements, change material and retest.

- B. Provide materials of each type from same source throughout the Work.

### **PART 3 – EXECUTION**

#### **3.1 TOPSOIL**

- A. Contractor shall strip topsoil and stockpile on site at a location determined by the Owner at the Contractor's expense. Topsoil shall be stockpiled in separate location from suitable excess material stockpile.
- B. Topsoil shall be placed to a depth of 4-inches over all disturbed or proposed landscaped areas.
- C. Topsoil shall be provided at Contractor's expense if it is not available from site.
- D. Any remaining topsoil will be hauled off site at the Contractors expense.
- E. Do not excavate wet topsoil.

#### **3.2 EXCAVATION**

- A. Suitable excavation material shall be transported to and placed in fill areas within limits of the work.
- B. Unsuitable material encountered in areas to be paved and under building pads, shall be excavated 2-feet below final grade and replaced with suitable material from site or borrow excavations. Contractor shall notify Engineer if more than 2-feet of excavation is needed to replace unsuitable material.

**REFERENCE ONLY**  
C. Unsuitable material not required for fill shall be disposed of offsite. Suitable surplus excavation material shall be stockpiled on site, separate from topsoil stockpile, for use as future fill material. Location to be coordinated with the Owner.

- D. Proper drainage, including sediment and erosion control, shall be maintained at all times. Methods shall be in accordance with the National Pollutant Discharge Elimination System standards and other local, state, and federal regulations.
- E. Unsuitable materials as stated herein are defined as highly plastic clay soils, of the CH and MH designation, border line soils of the SC-CH description, and organic soils of the OL and OH description based on the Unified Soils Classification System. Further, any soils for the top two feet of pavement subbase shall have no more than 35% passing the # 200 sieve.

#### **3.3 GROUND SURFACE PREPARATION FOR FILL**

- A. All vegetation, roots, brush, heavy sods, heavy growth of grass, decayed vegetable matter, rubbish, and other unsuitable material within the areas to be filled shall be stripped and removed prior to beginning the fill operation.
- B. After stripping but before fill placement, the loose, likely cultivated soils, in at-grade areas and areas to be filled must be recompacted/densified to enhance their pavement support characteristics and to prepare the areas for subsequent

fill placement. Similar work should be expected in the cut areas after the overburden materials are removed.

- C. Sloped ground surfaces steeper than 1 vertical to 4 horizontal, on which fill is to be placed shall be plowed, stepped, or benched, or broken up as directed, in such a manner where fill material will bond with the existing surface.
- D. Surfaces on which fill is to be placed and compacted shall be wetted or dried as may be required to obtain the specified compaction.

### **3.4 FILL**

- A. Shall be placed in successive horizontal layers not more than 8-inches in loose depth for the full width of the cross-section and compacted as required. In confined areas such as within utility trenches, the use of portable compaction equipment and 4-inch maximum thickness lifts of soil will be required to achieve specified degree of compaction. Fill shall be placed in accordance with the Geotechnical Report found in Section 01012.

### **3.5 FINISHED GRADING**

- A. All areas covered by the project including excavated and filled sections and adjacent transition areas shall be smooth graded and free from irregular surface changes.
- B. Degree of finish shall be that ordinarily obtainable from either blade-grader or scraper operations, supplemented with hand raking and finishing, except as otherwise specified.
- C. Unpaved areas to within 0.1-feet of elevations shown on the drawings provided such deviation does not create low spots that do not drain.
- D. Paved Areas - Subgrade to within 0.05-feet of the drawing elevations less the compacted thickness of the base and paving.
- E. Building Pads - Subgrade to within 0.05-feet of the drawing elevations less the thickness of the concrete slab.
- F. Ditches and pond banks shall be finished graded, dressed, and seeded within 14-calendar days of work to reduce erosion and permit adequate drainage.

### **3.6 DISPOSAL OF WASTE MATERIAL**

- A. All vegetation, roots, brush, sod, broken pavements, curb and gutter, rubbish, and other unsuitable or surplus material stripped or removed from limits of construction shall be disposed of by the Contractor.

### **3.7 PROTECTION**

- A. Graded areas shall be protected from traffic, erosion, settlement, or any washing away occurring from any cause prior to acceptance.

- B. Contractor shall be responsible for protection of below grade utilities shown on the drawings or indicated by the Owner at all times during earthwork operations.
- C. Repair or re-establishment of graded areas prior to final acceptance shall be at the Contractors expense.
- D. Site drainage shall be provided and maintained by Contractor during construction until final acceptance of the project. Drainage may be by supplemental ditching, or pumping if necessary, prior to completion of permanent site drainage.

### **3.8 DRAINAGE**

- A. Contractor shall be responsible for providing surface drainage away from all construction areas. This shall include maintenance of any existing ditches or those constructed in the immediate vicinity of the work. Contractor shall provide proper and effective measures to prevent siltation of wetlands, streams, and ditches on both the Owner's property, and those properties downstream.

### **3.9 FIELD QUALITY CONTROL**

- A. Compaction testing shall be performed in accordance with ASTM D 6938. Where tests indicate the backfill does not meet specified requirements, the backfill shall be reworked or removed and replaced, and then retested at the Contractor's expense.
- B. Unpaved areas - at least 95% of maximum laboratory density within 2% optimum moisture content, unless otherwise approved by the Engineer.
- C. Paved Areas and Under Structures - top 18-inch layer of subbase to at least 98% of maximum laboratory density within 2% optimum moisture content. Layers below top 18 inches shall be compacted to 95% of maximum laboratory density within 2% optimum moisture content.
- D. Rolling and compaction equipment and methods shall be subject to acceptance by the Engineer. Acceptance in no way relieves Contractor of the responsibility to perform in correct and timely means.
- E. Number of Tests - Under paved areas, no less than one density test per horizontal layer per 5,000 square feet of subbase shall be made. In unpaved areas, no less than one density test per horizontal layer per 10,000 square feet of fill area shall be made. Under curb and gutter, no less than one density test per every 300 linear feet. On building pads, no less than one density test per horizontal layer per 10,000 square feet of fill area shall be made.

### **3.10 PROOF ROLLING**

- A. Shall be required on the subbase of all curb and gutter and paved areas and on the base of all paved areas where designated by the Engineer. Proof rolling shall take place after all underground utilities are installed and backfilled. The operation shall consist of rolling the subbase or base with a fully loaded 10 wheeled dump truck. A full load shall consist of 10 to 12-cubic yards of soil or

rock. The dump truck shall be capable of traveling at a speed of two to five miles per hour and be in sound mechanical shape with no exhaust leaks or smoking from burning oil. The Engineer shall determine number of passes and areas rolled.

**END OF SECTION**

**REFERENCE ONLY**

**INDEX TO**  
**SECTION 02210 – SOIL EROSION CONTROL**

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**REFERENCE ONLY**

**SECTION 02210**  
**SOIL EROSION CONTROL**

**PART 1 – GENERAL**

**1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Special Conditions apply to this section.

**1.2 DESCRIPTION OF WORK**

- A. Extent of soil erosion control work includes all measures necessary to meet the requirements of this section.

Erosion and sediment control measures shall be installed prior to any construction activity.

Soil erosion and sediment control measures shall include all temporary and permanent means of protection and trapping soils of the construction site during land disturbing activity. Activity covered in this contract shall meet standards of NPDES General Permit for the state where work is performed.

**1.3 PURPOSES**

- A. Contractor is to achieve the following goals:

- REFERENCE ONLY**
1. Minimize soil exposure by proper timing of grading and construction.
  2. Retain existing vegetation whenever feasible.
  3. Vegetate and mulch denuded areas as soon as possible.
  4. Divert runoff away from denuded areas.
  5. Minimize length and steepness of slopes when it is practical.
  6. Reduce runoff velocities with sediment barriers or by increasing roughness with stone.
  7. Trap sediment on site.
  8. Inspect and maintain erosion control measures.

**1.4 QUALITY ASSURANCE**

- A. Manufacturer's Qualifications: Firms regularly engaged in the manufacture of soil erosion control systems products of types and sizes required, whose materials have been in satisfactory use for not less than 5-years.

- B. Codes and Standards: Comply with all applicable Local, State and Federal Standards pertaining to soil erosion control.

### 1.5 SUBMITTALS

- A. Product Data: Submit manufacturer's technical product data and installation instruction for soil erosion control materials and products.

### 1.6 MEASUREMENT AND PAYMENT

- A. Measurement and payment for will be paid for at the contract unit price for all silt fencing and erosion control management as indicated in the contract documents and installed in accordance with the Plans and Specifications. The cost of soil erosion control shall include all equipment, labor, materials, and maintenance necessary to comply with the State of South Carolina Erosion and Sediment Control Program.

## PART 2 – PRODUCTS

### 2.1 GRASSING MATERIALS

- A. Refer to Section 02902 - Grassing.
  - 1. General: All grass seed shall be free from noxious weeds, grade A recent crop, recleaned and treated with appropriate fungicide at time of mixture. Deliver to site in original sealed containers with dealer's guarantee as to year grown, percentage of purity, percentage of germination and date of the test by which percentages of purity and germination were determined. All seed sown shall have a date of test within six months of the date of sowing.
  - 2. Type of Seed: Either Annual Rye or Common Bermuda Grass seed will be used depending on time of year in which seeding is to occur.
  - 3. Mulch: Straw.
  - 4. Fertilizer: Commercial balanced 4-12-12 fertilizer.

### 2.2 SILT FENCE

- A. Silt fence shall be a woven geotextile fabric sheet. Fabric shall be a synthetic polymer composed of at least 85% by weight propylene, ethylene, amide, ester, or vinylidene chloride, and shall contain stabilizer and/or inhibitors added to the base plastic to make filaments resistant to deterioration due to ultra-violet and/or heat exposure. Fabric should be finished so the filaments will retain their relative position with respect to each other. Fabric shall be free of defects, rips, holes, or flaws.

Fabric shall meet the following requirements:

Woven Fabrics	
Grab Strength	90 lbs.
Burst Strength	175 PSI
UV Resistance	80%

### 2.3 CHEMICALS FOR DUST CONTROL

- A. Calcium Chloride, Anionic Asphalt Emulsion, latex Emulsion or Resin-in-Water Emulsion may be used for dust control.

### 2.4 RIP-RAP

- A. Shall be hard quarry or field stone of such quality the pieces will not disintegrate on exposure to water, sunlight, or weather. Stone shall range in weight from a minimum of 25-pounds to a maximum of 125-pounds. At least 50-percent of the stone shall weigh more than 60-pounds. The stone shall have a minimum dimension of 12-inches.

### 2.5 EROSION CONTROL BLANKET

- A. Use erosion control blanket SC150, from North American Green or approved equal; see Construction Drawings for installation details.
1. Use Bio stakes where staples are required or indicated on the drawings for stabilization.
    - a. Staple in pattern recommended by blanket manufacturer.
  2. Staple locations must be clearly marked on the blanket when stakes are used.
  3. Ensure product is rated to last at least 24-months.

REFERENCE ONLY

### 2.7 TEMPORARY FLOATING SKIMMER

- A. Use temporary floating skimmer specified on the construction plans. Product should at a minimum be equal to the Faircloth Skimmer size noted on the plans.
1. Inlet extension size shall be as noted on the plans.
  2. Skimmer should allow for drainage of pond from the water surface level to provide maximum sediment fallout.

### 2.8 TEMPORARY POROUS BAFFLES

- A. See product/material requirements specified on the Porous Baffle detail outlined on the plans.

## 2.9 PRODUCT REVIEW

- A. Contractor shall provide the Engineer with a complete description of all products before ordering. Engineer will review all products before they are ordered.

## PART 3 – EXECUTION

### 3.1 GENERAL

- A. All disturbed soil areas except those to support paving shall be graded and protected from erosion by grassing. Disturbed areas must be grassed within 14-days of work ending unless work is to begin again before 21-days. Storm water conveyance systems shall have sediment barriers installed at all entrances, intersections, change in direction and discharge points.

### 3.2 GRASSING

- A. Refer to Section 02902 - Grassing.

### 3.3 SEDIMENT BARRIERS

- B. Rock Ditch Check
  - 1. Excavate a 6-inch-deep trench the width and length of proposed barrier. Install a non-woven geotextile fabric in the trench before placing rock for the ditch check.
  - 2. The body of the ditch check shall be constructed of 12-inch rip-rap. The upstream face may be covered with 1-inch washed stone.
  - 3. Ditch checks shall not exceed a height of 2-feet at centerline of the channel and have a minimum top flow length of 2-feet.
  - 4. Rip-rap shall be placed over the channel banks to prevent water from flowing around ditch check. Rock must be installed by hand or mechanical placement (no dumping of rock) to achieve complete coverage of the ditch and ensure the center of the check is lower than the edges.
  - 5. The maximum spacing between ditch checks shall be where the toe of the upstream check is at the same elevation as the top of the downstream check.
  - 6. Contractor shall maintain ditch checks as required by State regulations.

### 3.4 SILT FENCE

- A. Silt fence shall be placed at approximate location shown and installed in accordance with the detail on the construction drawings. Contractor shall maintain silt fence as required by state regulations.

**3.5 DUST CONTROL**

- A. Dust raised from vehicular traffic will be controlled by wetting down access road with water or by the use of a deliquescent chemical, such as calcium chloride, if relative humidity is over 30%. Chemicals shall be applied in accordance with manufacturer's recommendations.
- B. Contractor shall use all means necessary to control dust on and near the work, or off-site borrow areas when dust is caused by operations during performance of work or if resulting from the condition in which any subcontractor leaves the site. Contractor shall thoroughly treat all surfaces required to prevent dust from being a nuisance to the public, neighbors, and concurrent performance of work on site.

**3.6 SEDIMENT BASIN**

- A. A sediment basin equal in volume to 3,600 cubic feet per disturbed acre is required. The sediment basin/lagoon adjacent to the outfall for the site shall be constructed and stabilized prior to any additional land disturbed activity. Install the sediment marker as shown on construction plans; maintain pond at proper cleanout depth per SCDHEC guidelines (50% storage volume minimum).

**3.7 RIP-RAP**

- A. Rip-Rap shall be placed at the locations shown and installed in accordance with the detail on the construction drawings.

**3.8 CONSTRUCTION EXIT**

- A. Construct exit at the location shown per detail on the construction drawings. Contractor shall maintain construction exit as required by state regulations.

**3.9 INLET PROTECTION**

- A. Install inlet protection per detail on the construction drawings. Contractor shall maintain inlet protection as required by state regulations until all disturbed surfaces are stabilized.

**3.10 EROSION CONTROL BLANKET**

- A. Provide on areas as shown on the construction plans.

**3.11 TEMPORARY FLOATING SKIMMER**

- B. Provide as shown on the construction plans in sequence with the sediment pond.

**3.11 TEMPORARY POROUS BAFFLES**

- A. Construct temporary porous baffles as shown on the construction plans and detail. Baffles shall be installed perpendicular to the length of the sediment basin.

**END OF SECTION**

**INDEX TO**  
**SECTION 02231 - AGGREGATE BASE COURSE**

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**REFERENCE ONLY**

**SECTION 02231**  
**AGGREGATE BASE COURSE**

**PART 1 – GENERAL**

**1.1 SECTION INCLUDES**

- A. Aggregate base course.

**1.2 RELATED SECTIONS**

- A. Section 01025 - Measurement and Payment: Requirements applicable to unit prices for the work of this section.
- B. Section 01400 - Quality Control.
- C. Section 01410 – Testing Services.
- D. Section 02204 - Earthwork
- E. Section 02512 - Asphaltic Concrete Binder/Surface Courses

**1.3 MEASUREMENT AND PAYMENT**

- A. Aggregate Base Course: Payment will be made at the contract unit price. Payment will include supplying all material, labor, and equipment, stockpiling, scarifying substrate surface, placing where required, and compacting.
- B. Prime Coat: Bituminous prime coat will not be measured for separate payment. All costs connected with applying prime coat will be included in the unit price bid for Aggregate Base Course.

**1.4 REFERENCES (LATEST REVISION)**

- A. ASTM C 131 – Resistance to Degradation of Small-Size Course Aggregate by Abrasion and Impact in the Los Angeles Machine.
- B. ASTM D 698 – Laboratory Compaction Characteristics of Soil Using Standard Effort.
- C. ASTM D 6938 – In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth).
- D. ASTM D 3740 – Minimum Requirements for Agencies Engaged in the Testing and/or Inspection of Soil and Rock Used in Engineering Design and Construction.
- E. ASTM E 329 – Agencies Engaged in Construction Inspection and/or Testing.

## 1.5 QUALITY ASSURANCE

- A. Perform work in accordance with the South Carolina Department of Transportation Standard Specifications for Highway Construction, latest edition, and all supporting Supplemental Technical Specifications.

## 1.6 TESTING

- A. Laboratory tests for moisture density relationship for fill materials shall be in accordance with Section 305.4.3 of the SCDOT Standard Specifications for Highway Construction, latest edition.
- B. In place density tests in accordance with ASTM D 6938.
- C. Testing laboratory shall operate in accordance with ASTM D 3740 and E 329 and be acceptable to the Engineer.
- D. Testing laboratory and Project Engineer/Project Representative shall be given a minimum of 48-hours' notice prior to taking any tests.
- E. Owner shall select and engage the Testing Laboratory. Testing Laboratory shall be responsible to the Owner and Owner's Engineer. Payment for laboratory and all tests shall be by the Owner, except Owner specifically reserves the right to deduct from Contractor's payment, expenses and charges of Testing Laboratory when:
  - 1. Contractor gives notice the work is ready for inspection and testing, and fails to be ready for the test, and/or
  - 2. Testing of the Contractor's work, products, or materials fail, and retesting is required, and/or
  - 3. Contractor abuses the services or interferes with the work of the testing laboratory in the conduct of this work.
- F. Test results shall be furnished to the Engineer prior to continuing with associated or subsequent work.

REFERENCE ONLY

## PART 2 – PRODUCTS

### 2.1 MATERIALS

- A. Aggregate shall consist of processed and blended crushed stone. Aggregates shall be free from lumps and balls of clay, organic matter, objectionable coatings, and other foreign material and shall be durable and sound. Coarse aggregate shall have a percentage of wear not to exceed 65% after 500 revolutions as determined by AASHTO T 96. Aggregate shall meet applicable requirements of Section 305.2 in the South Carolina Department of Transportation Standard Specifications for Highway Construction, latest edition, and all supporting Supplemental Technical Specifications. Material shall meet the following gradation and other requirements:

Granite Stone	
Sieve Size	Percent by Weight Passing
2"	100
1-1/2"	95 - 100
1"	70 - 100
1/2"	48 - 75
# 4	30 - 60
# 30	11 - 30
#200	0 - 12
Liquid Limit	0 to 25
Plasticity Index	0 to 6

- B. Prime Coat: Shall be EA-P Special, Emulsified asphalt, conforming to Section 407 of the South Carolina Department of Transportation Standard Specifications for Highway Construction, latest edition.

### PART 3 – EXECUTION

#### 3.1 EXAMINATION

- A. Verify subbase has been tested, is dry, and slopes and elevations are correct.
- B. ON SITE OBSERVATIONS OF WORK: The Owner's Representative or Engineer will have the right to require any portion of the work be completed in their presence and if the work is covered up after such instruction, it shall be exposed by the Contractor for observation at no additional cost to the Owner. However, if the Contractor notifies the Owner such work is scheduled, and the Owner fails to appear within 48-hours, the Contractor may proceed. All work completed, and materials furnished shall be subject to review by the Owner, Engineer or Project Representative. Improper work shall be reconstructed, and all materials, which do not conform to the requirements of the specifications, shall be removed from the work upon notice being received from the Engineer for the rejection of such materials. Engineer shall have the right to mark rejected materials to distinguish them as such.

Contractor shall give the Owner, Project Engineer or Project Representative a minimum of 48-hours' notice for all required observations or tests.

#### 3.2 PREPARATION

- A. Subbase shall be graded and shaped conforming to the lines, grades, and cross sections required and cleaned of all foreign substances prior to constructing base course. Do not place base on soft, muddy or frozen surfaces. Correct irregularities in subbase slope and elevation by scarifying, reshaping, and recompacting.
- B. At the time of base course construction, subbase shall contain no frozen material.

- C. Surface of subbase shall be checked by the Engineer or Project Representative for adequate compaction and surface tolerances. Ruts or soft yielding spots appearing in areas of subbase course having inadequate compaction, and areas not smooth or which vary in elevation more than 3/8 inch above or below required grade established on the plans, shall be corrected to the satisfaction of the Engineer or Project Representative. Base material shall not be placed until subbase has been properly prepared and test results have so indicated.

### 3.3 AGGREGATE PLACEMENT

- A. Aggregate shall be placed in accordance with South Carolina Department of Transportation Standard Specifications for Highway Construction, latest edition Section 305 and in accordance with all terms included in these specifications.
- B. Level and contour surfaces to elevations and slopes indicated.
- C. Add small quantities of fine aggregate to coarse aggregate as appropriate to assist compaction.
- D. Add water to assist compaction. If excess water is apparent, remove aggregate and aerate to reduce moisture content.
- E. Use mechanical tamping equipment in areas inaccessible to compaction equipment.
- F. While at optimum moisture ( $\pm 1-1/2\%$ ), compact base course with rollers capable of obtaining required density. Vibratory, flatwheel, and other rollers accepted by the Engineer may be used to obtain required compaction. Rolling shall continue until base is compacted to 100% of modified proctor as determined by ASTM D 1557. In-place density of the compacted base will be determined in accordance with ASTM D 6938.

### 3.4 PRIME COAT

- A. Bituminous material for the prime coat shall be applied uniformly and accurately in quantities of not less than 0.15 gallons per square yard nor more than 0.30 gallons per square yard of base course. All irregularities in the base course surface shall be corrected prior to application of prime coat. Clean the base course of all mud, dirt, dust, and caked and loose material
- B. Do not apply prime to a wet surface nor when temperature is below 40°F in the shade. Do not apply prime when rain threatens nor when weather conditions prevent proper construction and curing of prime coat.
- C. The primed base should be adequately cured before the binder or surface course is laid. In general, a minimum of 48 hours should be allowed for complete curing. Ordinarily, proper surface condition of the prime is indicated by a slight change in the shiny black appearance to a slightly brown color.

### 3.5 TOLERANCES

- A. Flatness: Maximum variation of ¼-inch measured with an acceptable 10-foot straight edge.
- B. Scheduled Compacted Thickness: Within 3/8-inch.
- C. Variation from Design Elevation: Within 3/8-inch.
- D. Depth measurements for compacted thickness shall be made by test holes through the base course. Where base course is deficient, correct such areas by scarifying, adding base material and recompacting as directed by the Engineer.

### **3.6 FIELD QUALITY CONTROL**

- A. Section 01400 - Quality Assurance: Field inspection.
- B. Density and moisture testing will be performed in accordance with ASTM D 698 and ASTM D 6938.
- C. If tests indicate Work does not meet specified requirements, remove Work, replace, and retest.
- D. Frequency of Tests:
  - 1. Base Density and Thickness - One test per 5,000 square feet.

**END OF SECTION**

**REFERENCE ONLY**

**INDEX TO**  
**SECTION 02275 - RIP-RAP**

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**REFERENCE ONLY**

**SECTION 02275****RIP-RAP****PART 1 – GENERAL****1.1 SECTION INCLUDES**

- A. Material placed as bank protection and erosion control.

**1.2 RELATED SECTIONS**

- A. Section 02210 - Soil Erosion Control

**1.3 ALLOWABLE TOLERANCES**

- A. Depth of rip-rap blanket as shown on the drawings and in these specifications is a minimum depth.

**1.4 MEASUREMENT AND PAYMENT**

- A. Rip-Rap: Payment will be made at the contract unit price. Payment will include furnishing all labor, materials as outlined on the construction plans, and equipment and placing on a prepared surface.

**1.5 REFERENCES (LATEST REVISION)**

- A. ASTM C 150 – Portland Cement.

**PART 2 – PRODUCTS****2.1 MATERIALS**

- A. Stone Rip-Rap: Shall be hard quarry or field stone of such quality the pieces will not disintegrate on exposure to water, sunlight or weather. Stone shall be solid and non-friable and range in weight from a minimum of 25-pounds to a maximum of 150-pounds. At least 50-percent of the stone pieces shall weigh more than 60 pounds. The stone pieces shall have a minimum dimension of 12-inches. Documents indicating stone analysis, source and other pertinent data (i.e. - filter fabric) shall be submitted for review by the Engineer prior to delivery.
- C. Filter Fabric: Shall be a woven fabric of monofilament and multifilament yarn equivalent to Mirafi FW700. Fabric shall be finished so the filaments will retain their relative position with respect to each other. Fabric shall contain stabilizers and/or inhibitors added to make filaments resistant to deterioration due to ultraviolet and/or heat exposure. Fabric shall be free of flaws, rips, holes or defects.

## 2.2 PRODUCT REVIEW

- A. Contractor shall provide the Engineer with a complete description of all products before ordering. Engineer will review all products before they are ordered.

## PART 3 – EXECUTION

### 3.1 PREPARATION

- A. The surface to receive rip-rap shall be prepared to a relatively smooth condition free of obstruction, depressions, debris, rises, and soft or low-density pockets of material. Contours and elevations on construction drawings are to the surface of rip-rap material.

### 3.2 PLACEMENT

- A. Filter fabric shall be placed with the long dimension running up slope. The strips shall be placed to provide a minimum width of one foot of overlap for each joint. Fabric shall be anchored in place with securing pins of the type recommended by fabric manufacturer. Pins shall be placed on or within 3-inches of the over-lap. Place fabric so upstream strip will overlap the downstream strip. Fabric shall be placed loosely to give and avoid stretching and tearing during placement of the stones.
- B. Minimum depth or thickness of stone blanket shall be 12-inches with no under tolerance. Stones shall be dropped no more than three feet during construction. Placing shall begin at bottom of slope. Provide a toe trench if required as detailed on the construction drawings. Entire mass of stone shall be placed to conform with lines, grades, and thickness shown on the plans. Rip-rap shall be placed to its full course thickness at one operation and in such a manner as to avoid displacing the underlying material. Placing of rip-rap in layers, or by dumping into chutes, or by similar methods likely to cause segregation, will not be permitted.

Larger stones shall be well distributed, and the entire mass of stone shall conform to gradation specified. All material used in rip-rap protection shall be placed and distributed so there will be no large accumulations of either the larger or smaller sizes of stone.

It is the intent of these specifications to produce a fairly compact rip-rap protection in which all sizes of material are placed in their proper proportions. Hand placing or rearranging of individual stones by mechanical equipment may be required to secure the results specified.

**END OF SECTION**

## INDEX TO

### SECTION 02512SC – ASPHALTIC CONCRETE INTERMEDIATE/SURFACE COURSES

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**SECTION 02512SC****ASPHALTIC CONCRETE INTERMEDIATE /SURFACE COURSES****PART 1 – GENERAL****1.1 SECTION INCLUDES**

- A. Surface Course
- B. Intermediate Course

**1.2 RELATED SECTIONS**

- A. Section 01025 – Measurement and Payment
- B. Section 01400 – Quality Control
- C. Section 01410 – Testing Services
- D. Section 02204 – Earthwork
- E. Section 02231 – Aggregate Base Course

**1.3 MEASUREMENT AND PAYMENT**

- A. Asphaltic Concrete Intermediate Course: Will be paid for at the contract unit price per square yard of completed and accepted intermediate course for the thickness specified.
- B. Asphaltic Concrete Surface Course: Will be paid for at the contract unit price per square yard of completed and accepted surface course for the thickness specified.
- C. Tack Coat: No separate payment will be paid for tack coat. Cost will be included in payment for asphalt intermediate course.
- D. Payment for pavement and tack coat will be in full for preparing and cleaning, providing all materials, labor and equipment including placing, compacting and testing.

**1.4 REFERENCES (LATEST REVISION)**

- A. ASTM D 946 – Penetration-Graded Asphalt-Cement for Use in Pavement Construction.
- B. ASTM E 329 – Agencies Engaged in Construction Inspection and/or Testing.
- C. ASTM D 3740 – Minimum Requirements for Agencies Engaged in Testing and/or Inspection of Soil and Rock Used in Engineering Design and Construction.

- D. ASTM D 2726 – Bulk Specific Gravity and Density of Non-Absorptive Compacted Bituminous Mixtures.
- E. ASTM D 2950 – Density of Bituminous Concrete in Place by Nuclear Methods.
- F. ASTM D 1188 – Bulk Specific Gravity and Density of Compacted Bituminous Mixtures Using Coated Samples.
- G. ASTM D 1754 – Effect of Heat and Air on Asphaltic Materials (Thin-film Oven Test).

### 1.5 QUALITY ASSURANCE

- A. Perform work in accordance with South Carolina Department of Transportation Standard Specifications for Highway Construction, latest edition, and all supporting Supplemental Technical Specifications.
- B. Mixing Plant: Conform to South Carolina Department of Transportation Standard Specifications for Highway Construction, latest edition, and all supporting Supplemental Technical Specifications.

### 1.6 ENVIRONMENTAL REQUIREMENTS

- A. Do not place asphalt mixture when ambient air temperature is less than that indicated in the Table nor when the surface is wet or frozen.

Lift Thickness	Min. Air Temperature, Degrees F.
1" or Less	55
1.1" to 2"	45
2.1" to 3"	40
3.1" to 4.5"	35

- B. Mixture shall be delivered to the spreader at a temperature between 250 degrees F and 325 degrees F.

### 1.7 GUARANTEE

- A. Contractor shall guarantee the quality of materials, equipment, and workmanship for a period of 12-months after acceptance. Defects discovered during this period shall be repaired by the Contractor at no cost to the Owner.

### 1.8 TESTING

- A. Testing laboratory shall operate in accordance with ASTM D 3740 and E 329 and be acceptable to the Engineer.
- B. Testing laboratory and Project Engineer/Project Representative shall be given a minimum of 48-hours' notice prior to taking any tests.

- C. Owner shall select and engage the testing laboratory. Testing laboratory shall be responsible to the Owner and Owner's Engineer. Payment for laboratory and all tests shall be by the Owner, except Owner specifically reserves the right to deduct from Contractor's payment, expenses and charges of testing laboratory when:
1. Contractor gives notice the work is ready for inspection and testing, and fails to be ready for the test, and/or
  2. Testing of the Contractor's work, products or materials fail, and retesting is required, and/or
  3. Contractor abuses the services or interferes with the work of the testing laboratory in the conduct of this work.
- D. Test results shall be furnished to the Engineer prior to continuing with associated or subsequent work.

## **PART 2 – PRODUCTS**

### **2.1 TACK COAT**

- A. Shall consist of asphalt binder (asphalt cement) or emulsified asphalt, conforming to Section 401 of the South Carolina Department of Transportation Standard Specifications for Highway Construction. Asphalt binder shall be PG64-22. The acceptable grades of emulsified asphalt are RS-1, MS-1, MS-2, HFMS-1, HFMS-2, SS-1, CRS-1, CRS-2, CMS-2, and CSS-1.

### **2.2 ASPHALT BINDER AND ADDITIVES**

- A. Shall be PG64-22 and conform to Section 401 of the South Carolina Department of Transportation Standard Specifications for Highway Construction, latest edition.
- B. Anti-Stripping: Shall conform to requirements of Section 401 of the South Carolina Department of Transportation Standard Specifications for Highway Construction, latest edition.

### **2.3 AGGREGATES**

- A. General: Mineral aggregate shall be composed of fine aggregate or a combination of fine and coarse aggregate. Coarse aggregate shall be that portion of the material retained on a No. 4 sieve.

Fine aggregate shall be considered that portion passing the No. 4 sieve. Fine aggregate, coarse aggregate, and any additives in combination with the specified percentage of asphalt cement shall meet the requirements of tests specified, before acceptance may be given for their individual use. Marine (Fossiliferous) limestone shall not be used.

- B. Fine Aggregate: Shall conform to the requirements of Section 401 of the South Carolina Department of Transportation Standard Specifications for Highway Construction, latest edition.
- C. Coarse Aggregate: Shall be granite stone and conform to the requirements of Section 401 of the South Carolina Department of Transportation Standard Specifications for Highway Construction, latest edition.
- D. Surface Course: The surface course shall consist of fine and coarse aggregate and mineral filler uniformly mixed with hot asphalt binder in an acceptable mixing plant. The plant shall conform to South Carolina Department of Transportation Standard Specifications for Highway Construction, latest edition. The gradations, asphalt content and air voids shall be the following:

TYPE B	
Square Sieve	% Passing
1 inch	100
3/4 inch	98 - 100
1/2 inch	90 - 100
3/8 inch	72 - 90
No. 4	44 - 62
No. 8	23 - 43
No. 30	10 - 25
No. 100	4 - 12
No. 200	2 - 8
% Asphalt Binder	4.5 - 6
Air Voids, %	3 - 4

REFERENCE ONLY

- E. Intermediate Course: The mineral aggregates and asphalt binder shall be combined in such proportions the composition by weight of the finished mixture shall be within the following range limits:

TYPE B	
Sieve Designation	Percentage by Weight Passing
1 inch	100
3/4 inch	90 - 100
1/2 inch	75 - 90
3/8 inch	64 - 80
No. 4	38 - 54
No. 8	22 - 36
No. 30	8 - 22
No. 100	3 - 10
No. 200	2 - 8
% Asphalt Binder	4.5 - 6
Air Voids, %	3 - 4

## 2.4 SOURCE QUALITY CONTROL AND TESTS

- A. Section 01400 – Quality Control and Section 01410 - Testing Laboratory Services.
- B. Submit proposed mix design for review prior to beginning of work.
- C. Test samples in accordance with the requirements of these specifications.

## PART 3 – EXECUTION

### 3.1 EXAMINATION

- A. On-Site Observations: Owner's Representative or Engineer will have the right to require any portion of work be completed in their presence. If work is covered up after such instruction, it shall be exposed by the Contractor for observation at no additional cost to Owner. However, if Contractor notifies Engineer such work is scheduled, and Engineer fails to appear within 48-hours, the Contractor may proceed. All work completed, and materials furnished shall be subject to review by the Engineer or Project Representative. Improper work shall be reconstructed. All materials, which do not conform to requirements of specifications, shall be removed from the work upon notice being received from Engineer for rejection of such materials. Engineer shall have the right to mark rejected materials to distinguish them as such.

Contractor shall give the Owner, Project Engineer or Project Representative a minimum of 48-hours' notice for all required observations or tests.

- B. Contractor shall verify base has been tested, is dry, and slopes and elevations are correct.

### 3.2 PREPARATION

- A. Apply tack coat in accordance with Section 401 of the South Carolina Department of Transportation Standard Specifications for Highway Construction, latest edition. Rate of application shall be 0.05 to 0.15 gallons per square yard of surface.
- B. Work shall be planned so no more tack coat than is necessary for the day's operation is placed on the surface. All traffic not essential to the work should be kept off the tack coat.
- C. Apply tack coat to contact surfaces of curbs and gutters. Apply in manner so exposed curb or gutter surfaces are not stained.
- D. Coat surfaces of manhole frames and inlet frames with oil to prevent bond with asphalt pavement. Do not tack coat these surfaces.

### 3.3 PLACEMENT

- A. Construction shall be in accordance with Sections 401, 402, and 403 of the South Carolina Department of Transportation Standard Specifications for Highway Construction, latest edition.
- B. Asphaltic concrete shall not be placed on a wet or frozen surface.
- C. Compaction shall commence as soon as possible after the mixture has been spread to the desired thickness. Compaction shall be continuous and uniform over the entire surface. Do not displace or extrude pavement from position. Hand compact in areas inaccessible to rolling equipment. Perform rolling with consecutive passes to achieve even and smooth finish without roller marks. Compaction rolling shall be complete before material temperature drops below 175° F.
- D. Areas of pavement with deficient thickness or density shall be removed and replaced at no additional cost to the Owner.

### 3.4 TOLERANCES

- A. General: All paving shall be subject to visual and straightedge evaluation during construction operations and thereafter prior to final acceptance. A 10-foot straightedge shall be maintained in the vicinity of the paving operation at all times for the purpose of measuring surface irregularities on all paving courses. The straightedge and labor for its use shall be provided by the Contractor. The surface of all courses shall be checked with the straightedge as necessary to detect surface irregularities. Irregularities such as rippling, tearing or pulling, which in the judgment of the Engineer indicate a continuing problem in equipment, mixture or operating technique, will not be permitted to recur. The paving operation shall be stopped until appropriate steps are taken by the Contractor to correct the problem.
- B. Flatness: All irregularities in excess of 1/8-inch in 10-feet for surface courses and 1/4-inch in 10-feet for intermediate courses shall be corrected.
- C. Variation from Design Elevation:
  - 1. General Paving: Less than 1/4-inch.
  - 2. Accessible Routes: Shall not exceed 1/4-inch. However, accessible routes shall not exceed maximum ADA allowable slopes. Contractor shall remove and replace any and all portions of the accessible route that exceed maximum ADA allowable slopes.
- D. Scheduled Compacted Thickness: Within 1/4-inch per lift.
- E. Pavement Deficient in Thickness: When measurement of any core indicates the pavement is deficient in thickness, additional cores will be drilled 10-feet either side of the deficient core along the centerline of the

lane until the cores indicate the thickness conforms to the above specified requirements. A core indicating thickness deficiencies is considered a failed test. Pavement deficient in thickness shall be removed and replaced with the appropriate thickness of materials. If the Contractor believes the cores and measurements taken are not sufficient to indicate fairly the actual thickness of the pavement, additional cores and measurements will be taken, provided the Contractor will bear the extra cost of drilling the cores and filling the holes in the roadway as directed.

### 3.5 FIELD QUALITY CONTROL

- A. Acceptance of the in-place density of the intermediate and surface courses shall be in accordance with the South Carolina Department of Transportation Standard Specifications for Highway Construction, latest edition.
- B. Density Testing: Performed in accordance with ASTM D-2726 and ASTM D-2950. Core samples for each day's operation shall be taken, tested and results reported to the Engineer the following day. The areas sampled shall be properly restored by the Contractor at no additional cost to the Owner. Nuclear gauge tests shall be taken during the asphaltic concrete placement.
  - 1. The pavement core and nuclear gauge densities shall range between 94% and 96% of the theoretical maximum density.
- C. Temperature:
  - 1. Asphaltic concrete shall not exceed 325 degrees F at any time.
  - 2. Asphaltic concrete shall not be placed once the temperature of the mix falls below 250 degrees F or the delivered temperature is more than 15 degrees F below the batch plant's delivery ticket.
  - 3. Temperature at time of loading shall be recorded on the truck delivery ticket.
- D. Frequency of Tests:
  - 1. Asphaltic Concrete – One test for each 250-tons placed.
    - a. Asphalt extraction and gradation test.
    - b. Core Sample
  - 2. Field determination of density by nuclear method every 5,000 square feet during construction of the asphaltic concrete intermediate/surface course.

**END OF SECTION**

**INDEX TO**  
**SECTION 02570 – TRAFFIC CONTROL**

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**REFERENCE ONLY**

**SECTION 02570**  
**TRAFFIC CONTROL**

**PART 1 – GENERAL**

**1.1 DESCRIPTION**

- A. This section covers furnishing, installation, and maintenance of all traffic control devices, portable signal equipment, warning signs, and temporary traffic lanes used during construction of the project.

**1.2 RELATED WORK**

- A. Section 02577 – Painted Traffic Striping

**1.3 RESPONSIBILITY**

- A. The Contractor shall furnish, install, and maintain all necessary automated signals, barricades, concrete traffic barriers, warning signs, traffic barriers, traffic lanes, and other protective devices. Ownership of these temporary warning devices shall remain with the Contractor provided devices are removed promptly after completion and acceptance of work to which devices pertain. If such warning devices are left in place for more than 30 days after specified time for removal, Owner shall have the right to remove such devices and to claim possession thereof.

**1.4 MEASUREMENT AND PAYMENT**

- A. Payment shall be included in the contract lump sum price for Traffic Control.

**PART 2 – PRODUCTS**

**2.1 MATERIALS**

- A. All barricades signs, and traffic control signal devices shall conform to requirements of the current Manual on Uniform Traffic Control Devices except as may be modified in these project specifications.
- B. Portable traffic control signal devices, barricades, signs and other Control Devices shall be either new or in acceptable condition when first erected on Project and shall remain in acceptable condition throughout the construction period.
- B. All signs shall have a black legend and border on an orange reflectorized background and will be a minimum of engineering grade reflective.

**PART 3 – EXECUTION**

**3.1 ERECTION**

- A. Prior to commencement of any actual construction on the project, Contractor shall erect appropriate advance warning signs and place concrete traffic barriers where

necessary. Subsequently, as construction progresses and shifts from one side of road to the other, temporary lanes must be installed to provide continuous two-way traffic and bike thoroughfare. All appropriate signs and traffic control devices pertinent to the work shall be erected ahead of construction site to advise and warn travelling public of activity and any necessary detours.

### 3.2 DELAYS TO TRAFFIC

- A. Except in rare and unusual circumstances, two-way traffic shall be maintained at all times by temporary and/or permanent roads. There are to be no traffic delays during the hours between 7 AM – 10 AM and 4 PM – 10 PM. Between the hours of 10 AM and 4 PM the maximum delay is to be 15-minutes.
- B. When traffic is halted temporarily due to transition procedures including the ingress and egress of construction vehicles, Contractor shall provide necessary flagging personnel with proper equipment and clothing to hold such traffic.
- C. If Contractor's proposed traffic control plan involves more than occasional disruption to alternating one-way traffic through the work, then temporary, signalized control equipment will be required.

### 3.3 TEMPORARY TRAFFIC LANES

- A. Two-lane traffic shall be maintained at all times unless prior written permission has been given and all necessary flagging personnel and/or signage has been installed. Temporary lane line stripes shall be applied to the detour paving, as agreed to by Engineer and Owner's representative. The no-passing double center-line stripes shall be yellow. Such stripes shall be a temporary, degradable, reflectorized tape strip. All temporary striping shall be maintained throughout the period traffic control is needed.
- B. Contractor is responsible for installation and removal of all temporary roads and trails throughout the construction process. These detour roads are to be in accordance with the Pavement Specifications herein.

### 3.4 SIGNS AND BARRICADES

- A. Contractor shall provide a detailed map showing location and verbage of all traffic control signs and methods for the project. All critical warning signs for the project will be a minimum of engineering grade reflective material and include appropriate flashing lights.
- B. Appropriate Safety Barricades shall be installed between bicycle trails, sidewalks, and the temporary traffic lanes. These barricades shall be impact resistant for passenger vehicles with a travelling speed of 40-mph.
  - 1. Advance warning signs: These signs shall be placed approximately 500-feet in advance of the construction site and detour on each approach to the construction area with subsequent warning signs every 250-feet, until construction site is met.

2. Barricades: While detour is open to traffic, a line of concrete traffic barricades shall be placed across the closed roadway to channelize traffic onto detour. They shall be spaced across the blocked roadway end to end so no vehicle will be able to pass between any two adjacent barricades.
3. Barriers: Shall be wooden having a minimum of 3 horizontal 6-inch rails spaced 20-inches on center. Markings for barrier rails shall be 6-inches wide alternate orange and white reflectorized stripes sloping downward at 45-degrees in the direction traffic is to pass.

During hours of darkness, the Contractor shall place and maintain flashing warning lights on tops of all barriers.

4. Direction Arrow Signs: At each change in traffic direction along the detour, Contractor shall install a sign with an arrow indicating change in traffic direction. This sign is to be located across the pavement from and facing on-coming traffic.
5. End Construction Sign: This sign shall be 60-inches x 24-inches and erected approximately 200-feet beyond end of construction area on the right-hand side.

**END OF SECTION**

**REFERENCE ONLY**

**INDEX TO**  
**SECTION 02577 – PAINTED TRAFFIC STRIPING**

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**REFERENCE ONLY**

**SECTION 02577****PAINTED TRAFFIC STRIPING****PART 1 – GENERAL****1.1 WORK INCLUDED**

- A. Striping shall consist of furnishing and applying traffic line paint in accordance with the contract drawings and specifications, and the requirements of the South Carolina Department of Transportation 2007 Standard Specifications for Highway Construction, latest edition.

**1.2 QUALITY ASSURANCE**

- A. Material and equipment shall be standard product of a manufacturer who has manufactured them for a minimum of 2-years and who provides published data on quality and performance of the product.

**1.3 GUARANTEE**

- A. Contractor shall guarantee the quality of materials and workmanship for a period of 12-months after acceptance. Defects discovered during this period shall be repaired by Contractor at no cost to the Owner.

**1.4 MEASUREMENT AND PAYMENT**

- A. Payment for striping will be paid for based on the lump sum contract price for Painted Traffic Striping and include all necessary equipment, labor, and materials to apply the striping or traffic control symbols.

REFERENCE ONLY

**PART 2 – PRODUCTS****2.1 PAINT**

- A. Paint shall be in conformance with Section 625 of the South Carolina Department of Transportation 2007 Standard Specifications for Highway Construction, latest edition.

**2.2 EQUIPMENT**

- A. The traveling traffic stripe painter shall be adaptable to traveling at a uniform, predetermined rate of speed both uphill and downhill in order to produce a uniform application of paint. Paint machine shall be of the spray type, capable of satisfactorily applying paint under pressure with a uniformity of feed through nozzles spraying directly upon pavement. Each machine shall be capable of applying three separate stripes, either solid or skip, in any specified pattern by utilizing three adjacent spray nozzles at the same time. Each paint tank shall be equipped with a mechanical agitator. Each nozzle shall be equipped with satisfactory cutoff valves which will apply broken or skip lines automatically. Each nozzle shall have a mechanical bead dispenser operating simultaneously with spray nozzle and

distribute beads in a uniform pattern at the rate specified. Each nozzle shall also be equipped with suitable line guides consisting of metallic shrouds or air blasts.

Hand painting equipment shall consist of suitable brushes, templates and guides necessary to produce satisfactory results.

Cleaning equipment shall consist of necessary brushes, brooms, scrapers, grinders, high pressure water jets and air blasters required to satisfactorily remove all foreign matter, from surfaces to be painted, without damage to the underlying pavement.

The traveling traffic stripe painter shall also be equipped with paint meters which will indicate amount of paint dispensed from each tank. Small, portable applicators or other special equipment may also be required.

### **2.3 GLASS BEADS**

- A. Glass beads shall be in conformance with Section 625 of the South Carolina Department of Transportation 2007 Standard Specifications for Highway Construction, latest edition.

### **2.4 PRODUCT REVIEW**

- A. Contractor shall provide the Engineer with a complete description of all products before ordering. The Engineer will review all products before they are ordered.

## **PART 3 – EXECUTION**

### **3.1 CONSTRUCTION OBSERVATION**

- A. Engineer or Project Representative will have the right to require any portion of the work be completed in their presence. If the work is covered up after such instruction, it shall be exposed by Contractor for observation. However, if Contractor notifies Engineer, or Project Representative such work is scheduled, and they fail to appear within 48-hours, the Contractor may proceed. All work completed, and materials furnished shall be subject to review by the Engineer. Improper work shall be reconstructed. All materials which do not conform to requirements of specifications shall be removed from the work upon notice being received from Engineer for rejection of such materials. Engineer shall have the right to mark rejected materials to distinguish them as such. Contractor shall give Engineer or Project Representative a minimum of 48-hours' notice for all required observations or tests.

### **3.2 STRIPING**

- A. Cleaning of Surface – Surfaces to be painted shall be thoroughly cleaned of all dust, dirt, grease, oil and other foreign matter before application of the paint.
- B. Alignment – Traffic stripes shall be of the length, width and placement specified. On sections where no previously applied markings are present, Contractor shall establish control points, satisfactory to Engineer, spaced at intervals insuring accurate locations of the stripe.

- C. Application – Traffic Stripe paint shall be applied by machine except for special areas and markings not adaptable to machine application, in which case, hand application will be permitted.

No paints shall be applied to areas of pavement when:

1. Any moisture or foreign matter is present on the surface;
2. The air temperature in the shade is below 50° F; or
3. Wind conditions are such as might cause dust to be deposited on prepared areas or to prevent satisfactory application of the paint and beads.

Painting shall be completed only during daylight hours and all painted areas shall be dry enough, before sunset, to permit crossing by traffic. All protective devices shall be removed not later than sunset to allow free movement of traffic at night.

Traffic stripe paint shall be thoroughly mixed in the shipping container before placing in machine tank. The paint machine tanks, connections and spray nozzles shall be thoroughly cleaned with thinner before starting each day's work.

The minimum wet film thickness for all painted areas shall be 15-mils.

Place a layer of glass beads immediately after laying the paint. Apply beads at a minimum rate of 6 pounds per gallon of paint.

- D. Protective Measures – When painting is completed around traffic, Contractor shall furnish and place all warning and directional signs necessary to direct, control, and protect traffic during the striping operations. Warning signs shall be set up before the beginning of each operation and extra signs shall be kept well ahead of painting equipment. When necessary, a pilot car shall be used to protect both traffic and the painting operation. The freshly painted stripe shall be protected by cones or other satisfactory devices. All stripe damaged by traffic, or pavement marked by traffic crossing wet paint, shall be repaired or corrected as specified below.

- E. Tolerance and Appearance – No stripe shall be less than the specified width. No stripe shall exceed the specified width by more than ½-inch. Alignment of the stripe shall not deviate from intended alignment by more than one inch on tangents and on curves up to and including one degree. On curves exceeding one degree, alignment of the stripe shall not deviate from the intended alignment by more than 2-inches.

Continued deviation from stated dimensions will be cause for stopping the Work and removing nonconforming stripe.

All stripes and segments of stripes shall present a clean cut, uniform and workmanlike appearance. All markings which fail to have a uniform, satisfactory appearance, either day or night, shall be corrected at the Contractor's expense.

- F. Corrective Measures – All traffic stripe which fails to meet the Specifications, permissible tolerances and appearance requirements, or is marred or damaged by traffic or from other causes, shall be corrected at Contractor's expense. All misted

areas, drip and spattered paint shall be removed to the satisfaction of Engineer. In all instances, when it is necessary to remove paint, it shall take place by means satisfactory to Engineer, which will not damage the underlying surface of pavement. When necessary to correct a deviation, which exceeds permissible tolerance in alignment, the portion of stripe so affected shall be removed plus an additional 25-feet in each direction, and a new stripe then painted in accordance with these specifications.

- G. Acceptance – All sections of painted stripe, words and symbols which have dried to the extent paint will not be picked up or marred by tires of vehicles, and which have been placed in reasonably close conformity with Plans and Specifications, will be accepted, and Contractor will be relieved of responsibility of maintenance on such sections.

**END OF SECTION**

**REFERENCE ONLY**

## INDEX TO

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**SECTION 02667SC**  
**WATER DISTRIBUTION SYSTEM**

**PART 1 – GENERAL**

**1.1 SECTION INCLUDES**

- A. Piping
- B. Valves
- C. Fittings
- D. Connect to Existing System
- E. All necessary appurtenances to convey potable water from the existing system to the location shown on the plans.

**1.2 RELATED SECTIONS**

- A. Section 02110 – Site Clearing
- B. Section 02204 – Earthwork
- C. Section 02231 – Aggregate Base Course
- D. Section 02512SC - Asphaltic Concrete Binder Surface Courses (SC)
- E. Section 02720 – Storm Drainage
- F. Section 02731 – Wastewater Collection System
- G. Section 02902 – Grassing

**1.3 OPTIONS**

OMITTED

**1.4 REFERENCES (Latest Revision)**

- A. ASTM D 3740 – Minimum Requirements for Agencies Engaged in Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction.
- B. ASTM E 329 – Agencies Engaged in Construction Inspection and/or Testing.
- C. ASTM D 1784 – Rigid Poly (Vinyl Chloride) (PVC) Compounds and Chlorinated Poly (Vinyl Chloride) (CPVC) Compounds.
- D. ASTM D 2241 – Poly (Vinyl Chloride) (PVC) Pressure-Rated Pipe (SDR - Series).

- E. ANSI/AWWA C 901 – Polyethylene (PE) Pressure Pipe and Tubing, ½-inch through 3-inches for Water Service.
- F. ANSI/AWWA C 900 - Polyvinyl Chloride (PVC) Pressure Pipe and Fabricated Fittings, 4-inches through 12-inches, for Water Transmission and Distribution.
- G. ANSI/AWWA C 509 – Resilient-Seated Gate Valves for Water Supply Service.
- H. ANSI/AWWA C 502 – Dry-Barrel Fire Hydrants.
- I. ANSI/AWWA C 800 – Underground Service Line Valves and Fittings.
- J. ANSI/AWWA C 605 – Underground Installation of Polyvinyl Chloride (PVC) Pressure Pipe and Fittings for Water.
- K. ASTM D 6938 – In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth).
- L. ANSI/AWWA C 651 – Disinfecting Water Mains.
- M. ASTM D 698 – Laboratory Compaction Characteristics of Soil Using Standard Effort.
- N. ANSI B-18.2.2 – Square and Hex Bolts and Screws.
- O. ANSI B-18.2.2 – Square and Hex Nuts.
- P. ANSI/NSF Standard 61.

Q. Installation of water mains and appurtenances shall be conducted in accordance with Section C of the AWWA Standards and/or manufacturer's recommended installation procedures.

## 1.5 QUALITY ASSURANCE

- A. Materials – Contractor will furnish the Engineer and Owner a description of all material before ordering. Engineer will review the Contractor's submittals and provide in writing an acceptance or rejection of material.
- B. Manufacturer – Material and equipment shall be standard products of a manufacturer who has manufactured them for a minimum of 2-years and who provides published data on quality and performance of the products.
- C. Subcontractor – A subcontractor for any part of the work must have experience on similar work, and if required, furnish Engineer with a list of projects and Owners or Engineers who are familiar with its competence.
- D. Design – If Contractor wishes to furnish devices, equipment, structures, and systems not designed by Engineer, these items shall be designed by either a Professional Engineer registered in the state of this project, or by someone Engineer accepts as qualified. If required, complete design calculations and assumptions shall be furnished to the Engineer or Owner before acceptance.

- E. Testing Agencies – Soil testing shall be conducted by a testing laboratory which operates in accordance with ASTM D 3740 and E 329 latest revision and be acceptable to the Engineer prior to engagement. Mill certificates of tests on materials made by manufacturers will be accepted provided manufacturer maintains an adequate testing laboratory, makes regularly scheduled tests that are spot checked by an outside laboratory, and furnishes satisfactory certificates with name of entity making the test.
- F. Hydrostatic tests on pipe shall be made by Contractor with equipment qualified by the Engineer. The Engineer or Project Representative reserves the right to accept or reject testing equipment. Hydrostatic testing shall be conducted in the presence of Engineer or Project Representative and a representative of Water Supplier.
- G. All pipe, fittings, packing, jointing materials, valves, and fire hydrants shall conform to Section C of the American Water Works Association (AWWA) Standards.
- H. All materials and products which contact potable water must be third party certified as meeting the specifications of ANSI/NSF Standard 61.

#### 1.6 REQUIREMENTS OF REGULATORY AGENCIES

- A. Water mains shall be sterilized to meet requirements of the appropriate Health Department. Sterilization shall be in accordance with AWWA Standards C-651, latest revision.
- B. Any pipe, solder, or flux which is used in the installation or repair of any public water system or in any plumbing in a residential or nonresidential facility which provides water, through connection to a public water system, for human consumption shall be lead-free. Lead-free is defined as not more than 0.2% lead with respect to solder and flux and not more than 8.0% lead with respect to pipes and pipe fittings. Leaded joints necessary for repair of cast iron pipes shall be exempt from the lead-free requirement.
- C. Sewer Manholes: No water pipe shall pass through or come in contact with any part of a sewer manhole. Water lines may come in contact with storm sewers or catch basins if there is no practical alternative, provided ductile iron is used, no joints of water line are within the storm sewer or catch basin, and joints are located as far as possible from storm sewer or catch basin.
- D. Where the minimum cover of 36-inches cannot be provided, pipe shall be steel, concrete, ductile iron, or other material and method acceptable to DHEC, and, when necessary, insulated to prevent freezing.
- E. Chambers, pits, or manholes containing valves, blow-off, meters, air release valves, or other such appurtenances to a distribution system, shall not be connected directly to any storm drain or sanitary sewer.
- F. There shall be no connection between distribution system and any pipes, pumps, hydrants, or tanks whereby unsafe water or other contaminated materials may be discharged or drawn into the system.

- G. Asbestos cement pipe shall not be used in potable water system except in the repair of existing asbestos cement lines.
- H. Thermoplastic pipe shall not be used above grade.
- I. Steel pipe shall not be allowed in water systems unless specified as in AWWA C200 or ASTM A53.
- J. Water mains shall be installed out of contaminated areas, unless using piping materials protecting the system (i.e., Ductile Iron Pipe with chemical resistant gaskets). Route lines out of contaminated areas if possible.
- K. Cross Connection Control (Backflow Prevention Devices):
  - 1. There shall be no connection between the distribution system and any pipes, pumps, hydrants, or tanks whereby unsafe water or other contaminated materials may be discharged or drawn into the system.
  - 2. No-by-passes shall be allowed, unless the bypass is also equipped with an acceptable backflow prevention device.
  - 3. All piping up to inlet of the backflow prevention device must be suitable for potable water. The pipe must be AWWA or NSF approved. Black steel pipe cannot be used on inlet side of the device.
- L. Drain-fields and Spray-fields: Potable water lines shall not be laid less than 25-feet horizontally from any portion of a waste-water tile-field or spray-field or shall be otherwise protected by an acceptable method approved by the Department.

## 1.7 **PRODUCT DELIVERY, STORAGE & HANDLING**

- A. Material shall be unloaded in a manner avoiding damage and shall be stored where it will be protected and will not be hazardous to traffic. The Contractor shall repair any damage caused by the storage. Material shall be examined before installation and neither damaged nor deteriorated material shall be used in the work.

## 1.8 **SEQUENCING AND SCHEDULING**

- A. Contractor shall arrange work so sections of mains between valves are tested, sterilized, pavement replaced, and the section placed in service as soon as reasonable after installation.

## 1.9 **ALTERNATIVES**

- A. The intention of these specifications is to produce the best system for the Owner. If Contractor suggests alternative material, equipment or procedures will improve the results at no additional cost, Engineer and Owner will examine suggestion, and if it is accepted, it may be used. The basis upon which acceptance of an alternative will be given is its value to the Owner, and not for Contractor's convenience.

**1.10 GUARANTEE**

- A. Contractor shall guarantee the quality of materials, equipment, and workmanship for a period of 12-months after acceptance. Defects discovered during this period shall be repaired by Contractor at no cost to the Owner.

**1.11 EXISTING UTILITIES**

- A. All known utility facilities are shown schematically on plans and are not necessarily accurate in location as to plan or elevation. Utilities such as service lines or unknown facilities not shown on plans will not relieve the Contractor of responsibility under this requirement. "Existing Utilities Facilities" means any utility existing on the project in its original, relocated, or newly installed position. Contractor will be held responsible for the cost of repairs to damaged underground facilities; even when such facilities are not shown on plans
- B. The Contractor shall call for underground utility locations before starting work. Underground utilities location service can be contacted at 811 or 1-888-721-7877.

**1.12 CONNECT NEW MAIN TO EXISTING SYSTEM**

- A. Contractor shall furnish necessary pipe and perform all excavation, dewatering, shoring, backfilling, etc., necessary to make the connection of a new main to existing water system. Contractor shall contact the Superintendent of Water Utility a minimum of 48-hours in advance of construction. Contractor shall be responsible for coordinating construction with the utility operator.

**1.13 DAMAGE TO EXISTING WATER SYSTEM**

- A. Damage to any part of the existing water system by Contractor or Subcontractors, repaired by Utility Owner's forces, shall be charged to Contractor on basis of time and material, plus 30% for overhead and administration.

**1.14 MEASUREMENT AND PAYMENT**

- A. Measurement – The length of mains, and branch lines to be paid for will be determined by measurement along the centerline of the various sizes and types of pipe actually furnished and installed, from the center of fitting, and from the center of the main to the end of the branch connection. No deduction will be made for the space occupied by valves and fittings.
- B. Payment –
1. Pipe – Payment will be made at the contract unit price per linear foot for the various types and sizes of pipe that are actually placed, as shown on the plans, or as directed by the Engineer. Excavation, dewatering, shoring, installation, backfill, compaction, testing, metal detector tape, tracing wire, and all other incidentals to installation of the mains shall be considered as subsidiary obligations of the Contractor for the completion of the line in place.

2. Fittings – Fittings to be included in cost of pipe.
3. Valves – Payment will be made at the contract unit price for each size. Payment will include furnishing and installing the valve, valve boxes, extensions, or manholes.
4. Fire Hydrants – Payment will be made at the contract unit price. Payment will include the cost of furnishing, installing and connecting the hydrant, gravel sump, restrained joints, backfilling, and painting. The 6–inch pipe from the main line to the hydrant will be paid for as 6–inch pipe. Gate valve and valve box will be paid for separately.
5. Cleaning and Disinfecting – No separate payment will be made for cleaning and disinfecting. Cleaning and disinfecting piping in the distribution system will be included in the lump sum and unit prices for the appropriate items.
6. Metal Detector Tape – No separate payment will be made for tape. The cost of furnishing and placing metal detector tape shall be included in the contract unit price for installing pipe.
7. Connections to Existing Mains – Payment will be made at the contract unit price for each type connection and will include all equipment, labor, and materials required to locate, excavate, cut, connect, backfill, and compact.
8. Sheeting and Bracing – Will not be measured for direct payment. All costs and charges in connection therewith shall be reflected and included in the item of work to which it pertains.
9. Tracing Wire – No separate payment will be made for wire. The cost of furnishing and placing location wire shall be included in the contract unit price for installing pipe.
10. Restrained Joints – No additional payment. Payment will include all labor, materials, and equipment necessary to furnish and install each restrained joint.

**REFERENCE ONLY**

#### **1.15 TESTING**

- A. Laboratory tests for moisture density relationship for fill materials shall be in accordance with ASTM D 698 (Standard Proctor).
- B. In place density tests in accordance with ASTM D 6938.
- C. Testing laboratory shall operate in accordance with ASTM D 3740 and E 329 and be acceptable to the Engineer.
- D. The testing laboratory and Project Engineer/Project Representative shall be given a minimum of 48-hours' notice prior to taking any of the tests.

- E. Testing Laboratory shall be selected by, engaged by and be the responsibility of the Owner. Testing Laboratory shall be responsible to the Owner and the Owner's Engineer. Payment for laboratory and all tests shall be by the Owner, except the Owner specifically reserves the right to deduct from the contractor's payment, the expense and charges of the Testing Laboratory when:
1. the contractor gives notice that his work is ready for inspection and testing, and the contractor fails to be ready for the test, and/or
  2. the test of the contractor work products or materials fail, and retesting is required, and/or
  3. the contractor abuses the services or interferes with the work of the testing laboratory in the conduct of this work
- F. Test results shall be furnished to the Engineer prior to continuing with associated or subsequent work.

## PART 2 – PRODUCTS

Products and materials used in the work shall conform to the following:

### 2.1 GENERAL REQUIREMENTS

- A. All material or products that come into contact with drinking water shall be third party certified as meeting the specifications of the American National Institute/National Sanitation Foundation Standard 61, Drinking Water System Components – Health Effects. The American National Standards Institute shall accredit the certifying party.

- B. All pipe, fittings, packing, jointing materials, valves, and fire hydrants shall conform to Section C of the AWWA Standards.

REFERENCE ONLY

### 2.2 PIPE

- A. P.V.C. – All pipe shall be blue in color with factory marked homing lines. Pipe 4 inches through 12 inches shall conform to all requirements of AWWA C-900, DR 18, pressure class of 235 p.s.i. and shall have the following minimum wall thickness:

4 inches	0.267 inches
6 inches	0.383 inches
8 inches	0.503 inches
10 inches	0.617 inches
12 inches	0.733 inches

Pipe with diameter less than 4 inches shall conform to all requirements of ASTM D-1784 and D-2241 (SDR 21). The pipe shall have a minimum pressure rating of 200 p.s.i. Certificates of conformance with the foregoing specifications shall be furnished with each lot of pipe supplied. All P.V.C. pipe shall bear the National Sanitation Foundation Seal of Approval.

- B. The use of solvent-weld PVC pipe in water mains 4-inches and larger is prohibited.

## 2.3 JOINTS

- A. Plastic Pipe – Joints in plastic pipe 4 inches and larger shall meet all requirements of AWWA C-900. Joints in plastic pipe 14 inches through 18 inches shall meet all requirements of AWWA C905. Joints in plastic pipe with a diameter less than 4 inches shall conform to ASTM D-3139. The use of solvent-weld PVC fittings in water mains 4 inches and larger is prohibited.
- B. Restrained Joints (Mechanical Joints) – Restrained joints for pipe, valves and fittings shall be mechanical joints with ductile iron retainer glands equivalent to “Megalug” or push-on type joints equivalent to “Lok-Ring,” “TR Flex,” or “Super Lock” and shall have a minimum rated working pressure of 250-p.s.i. for ductile iron pipe and 100-p.s.i. with a minimum safety factor of 2:1 for PVC pipe. The joints shall be in accordance with the applicable portions of AWWA C-111. The manufacturer of the joints shall furnish certification, witnessed by an independent laboratory, that the joints furnished have been tested without signs of leakage or failure. Restrained joints shall be capable of being deflected after assembly.
- C. Restrained Joints (Thrust Blocks):
1. General:
    - a. Provide thrust blocks, or metal tie rods and clamps or lugs, on plugs, caps, tees, hydrants and bends deflecting 11-1/4° or more either vertically or horizontally, and on all except restrained joint water lines. Thrust blocking is not required where restrained joints are indicated.
    - b. Provide concrete thrust blocking with a compressive strength of 3000-psi in 28-days.
    - c. Size of the blocking will be determined per the City of Florence Detail.
    - d. Provide 8-mil. Polyethylene film between the thrust block and fittings.
  2. Installation:
    - e. Locate thrust blocking between solid ground and the fitting to be anchored.
    - f. Unless otherwise shown or directed by the Engineer, place the base and thrust bearing sides of thrust blocking directly against undisturbed earth.
    - g. Sides of thrust blocking not subject to thrust may be placed against forms.
    - h. Place thrust blocking so the fitting joints will be accessible for repair.
    - i. Protect steel rods and clamps by hot dipped galvanizing.
- D. Natural rubber or other material which will support microbiological growth may not be used for any gaskets, o-rings, and other products used for jointing pipes,

REFERENCE ONLY

setting meters and valves or other appurtenances which will expose such material to water.

## 2.4 FITTINGS

- A. Fittings for Plastic Pipe – Shall be ductile iron, manufactured in accordance with ANSI A-21.53 (AWWA C-153). They shall be cement lined in accordance with ANSI A-21.4 (AWWA C-104). Fittings shall be designed to accommodate the type of pipe used.
- B. Fittings for Plastic Pipe – Less than 4 inches shall be PVC with ring tite rubber joints conforming to ASTM D-3139.
- C. The use of solvent-weld PVC fittings in water mains 4 inches and larger is prohibited.

## 2.5 GATE VALVES

- A. 2-Inches and Larger – Shall be cast iron or ductile iron body, bronze mounted, double disc or resilient wedge design, with non-rising stems, conforming to AWWA C-500, C-509, or C-515. Valves shall have a working pressure of 200 p.s.i. and be tested at 400-p.s.i.

Valves shall be furnished with "O" ring packing. Two "O" rings shall be located above the thrust collar and one "O" ring below. The thrust collar shall be permanently lubricated and have an anti-friction washer on top of the thrust collar.

Valves installed in pits or above ground shall be furnished with hand wheels. Buried valves shall be furnished with square operating nuts.

- B. Smaller than 2-Inches – Shall be all brass, ball valve type. The pressure rating shall be 175-p.s.i.
- C. Valve Boxes – Underground valves shall be installed in acceptable valve boxes. The valve boxes shall have a suitable base which does not damage the pipe, and shaft extension sections to cover and protect the valve and permit easy access and operation. The box, cover, and any extensions needed shall be cast or ductile iron having a crushing strength of 1,500-pounds per linear foot. Valve boxes shall conform to the detail shown.

## 2.6 BUTTERFLY VALVES

OMITTED

## 2.7 AIR RELEASE, AIR/VACUUM AND COMBINATION AIR VALVES

OMITTED

## 2.8 FIRE HYDRANTS

- A. General – Hydrants shall be manufacturer's current model design and construction. All units to be complete including joint assemblies. Physical characteristics and compositions of various metal used in the hydrant components shall meet the requirements as specified in AWWA C-502 latest revision. Hydrants shall be suitable for working pressure of 150-p.s.i.
- B. Bonnet – Bonnet may have oil filled or dry reservoir. If oil filled, bonnet must have "O" ring packing, so all operating parts are enclosed in a sealed oil bath. Oil filler plug shall be provided in bonnet to permit checking of oil level and adding oil when required. If dry type, hydrant top must have lubricating hole or nut for ease of lubrication. All parts must be removed through top of hydrant without moving entire barrel section from safety flange.
- C. Nozzles and Caps – The hydrant shall have 2-1/2-inch connections and 4-1/2-inch steamer connection, National standard threads. Nozzles shall be bronze and have interlocking lugs to prevent blowout. Nozzle caps shall be secured to fire hydrant with non-kinking type chain with chain loop on cap ends to permit free turning of caps.
- D. Seat Ring – Seat ring shall be bronze.
- E. Drain Valves and Openings – Positive operating drain valves shall be provided to assure drainage of fire hydrant when the main valve is closed. Drain openings shall have bronze bushings.
- F. Main Valve – Valve shall be designed to close with the pressure and remain closed. Valve shall be made from material resisting damage from rocks or other foreign matter. Valve shall have a full 4-1/2-inch opening.
- G. Barrel and Safety Flanges – Hydrants shall have a safety-type vertical barrel with 3-1/2-foot bury and be designed with safety flanges and/or bolts to protect the barrel and stem from damage and to eliminate flooding when hydrant is struck. Bury depth shall be cast on barrel of hydrant.
- H. Operating Stop and Nut – Hydrant shall have a positive stop feature to permit opening of hydrant without over travel of stem. Operating nut shall be bronze, 1-1/2-inch, point to flat, pentagon.
- I. Bolts and Nuts – Bolts, washers and nuts shall be corrosion resistant.
- J. Inlet – Bottom inlet of hydrant shall be provided with mechanical joint connection as specified and shall be 6-inch nominal diameter.
- K. Direction of Opening – Hydrant shall be designed to close "right" or clockwise and open "left" or counter-clockwise.
- L. Coatings – All inside and outside portions of hydrant shall be coated in accordance with AWWA C-502. The exterior portion of hydrant above ground level shall be painted with two coats of best grade zinc chromate primer paint

and with two coats of approved hydrant enamel. Color shall be Factory Safety Yellow unless otherwise designated by Owner.

- M. Joint Assemblies – Complete joint assemblies consisting of gland, gasket, bolts, and nut shall be furnished for mechanical joint inlets.

## 2.9 SERVICE CONNECTIONS

OMITTED

## 2.10 TAPPING SLEEVES

OMITTED

## 2.11 CURB STOPS

OMITTED

## 2.12 BACKFLOW PREVENTER ASSEMBLY

OMITTED

## 2.13 CASING

OMITTED

## 2.14 CASING SPACERS

OMITTED

## 2.15 METAL DETECTOR TAPE

- A. The tape shall consist of 0.35-mils thick solid foil core encased in a protective plastic jacket resistant to alkalis, acids, and other destructive elements found in the soil. The lamination bond shall be strong enough the layers cannot be separated by hand. Total composite thickness to be 5.0-mils. Foil core to be visible from unprinted side to ensure continuity. The tape shall have a minimum 3-inch width and a tensile strength of 35 lbs. per inch.

A continuous warning message indicating "potable water" repeated every 16-inches to 36-inches shall be imprinted on the tape surface. The tape shall contain an opaque color concentrate designating the color code appropriate to the line being buried (Water Systems - Safety Precaution Blue).

## 2.16 TRACING WIRE

- A. Tracing wire shall be # 12 gauge insulated single strand copper wire.

## 2.17 PRODUCT REVIEW

- A. Contractor shall provide the Engineer with a complete description of all products before ordering. The Engineer will review all products before they are ordered.

## PART 3 – EXECUTION

### 3.1 ON-SITE OBSERVATION

- A. Owner's Representative or Engineer shall have the right to require any portion of work be completed in their presence. If any work is covered up after such instruction, it shall be exposed by the Contractor for observation. However, if Contractor notifies Engineer such work is scheduled, and Engineer fails to appear within 48 hours, the Contractor may proceed. All work completed, and materials furnished shall be subject to review by the Engineer or Project Representative. Improper work shall be reconstructed. All materials which do not conform to requirements of specifications shall be removed from the work upon notice being received from Engineer for rejection of such materials. Engineer shall have the right to mark rejected materials to distinguish them as such.

Contractor shall give the Project Engineer or Project Representative a minimum of 48-hours' notice for all required observations or tests.

It will also be required of Contractor to keep accurate, legible records of the location of all water lines, service laterals, valves, fittings, and appurtenances. These records will be prepared in accordance with the paragraph on "Record Data" in Special Conditions. Final payment to the Contractor will be withheld until all such information is received and accepted.

### 3.2 INSTALLATION

- A. Plastic pipe shall be laid in accordance with AWWA C 605, ASTM D 2774, UNI-Bell UNI-B 3 and the pipe manufacturer's recommendations. The standards are supplemented as follows:

**REFERENCE ONLY**

1. Depth of Pipe – Contractor shall perform excavation of whatever substances are encountered to a depth providing a minimum cover over top of pipe of 36-inches from the existing or proposed finished grade, unless pipe material is steel, concrete, ductile iron, or other accepted material, and if exposed, should be insulated to prevent freezing.
2. Alignment and Grade – Water mains shall be laid and maintained to lines and grades established by the plans and specifications, with fittings, valves, and hydrants at required locations unless otherwise accepted by Owner. Valve-operating stems shall be oriented in a manner to allow proper operation. Hydrants shall be installed plumb.
  - a. Prior Investigation – Prior to excavation, investigation shall be made to the extent necessary to determine location of existing underground structures, utilities, and conflicts. Care shall be exercised by the Contractor during excavation to avoid damage to existing structures and utilities. Pipe manufacturer's recommendations shall be used when the watermain being installed is adjacent to a facility cathodically protected.

- b. Unforeseen Obstructions – When obstructions not shown on plans are encountered during progress of work and interfere, so an alteration of the plans is required, Owner will alter plans, or order a deviation in line and grade, or arrange for removal, relocation, or reconstruction of obstructions.
  - c. Clearance – When crossing existing pipelines or other structures, alignment and grade shall be adjusted as necessary, with the acceptance of Engineer, to provide clearance as required by federal, state, and local regulations or as deemed necessary by Engineer to prevent future damage or contamination.
3. Trench Construction – The trench shall be excavated to alignment, depth, and width specified or shown on plans and shall be in conformance with all federal, state, and local regulations for protection of workers.
  4. Joint Restraint – All hydrants, bends, plugs, valves, caps and tees on 2-inch pipe and larger, shall be provided with stainless steel tie rods or joint restraints equivalent to Megalugs, or by thrust blocking. Additional restraint shall be as indicated on the drawings.
  5. Anchorage for Hydrants - A concrete block 1-foot x 1-foot x 2-feet shall be poured between back of hydrant and undisturbed earth of the trench side without covering weep holes and bolts. Joint restraints equivalent to Megalugs manufactured by EBAA Iron may be used in lieu of concrete blocking.
  6. Hydrostatic Testing:
    - a. General:
      - i. Pressure and leakage testing must be conducted in accordance with AWWA Standards C600.
      - ii. Clean and flush line of air, dirt and foreign material.
      - iii. Do not perform hydrostatic tests until at least five days after installation of concrete thrust blocking.
      - iv. Test pump, pipe connection, pressure gauges, measuring devices and all other necessary appurtenances to conduct tests are to be provided by the Contractor.
      - v. Install brass corporation cocks at all high points that do not have permanent air vents. Corporation cocks are to be left in place and all costs for providing such cocks are to be borne by the Contractor.
      - vi. Conduct tests on each line or valved section of line.
      - vii. Test pressures to be 150-psi, or 1.5 times the maximum working pressure, whichever is greater, based on the elevation of the lowest point of the section under test and corrected to the elevation of the test gauge.
      - viii. Do not test pipe at pressures exceeding manufacturer's recommendations.

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- ix. The Contractor must provide documentation of the pressure and leakage tests. Documentation must include length of lines, diameter of pipe(s), amount of water required to fill line after test was performed, and amount of allowable leakage.
- x. The witness to the hydrostatic testing is to be someone other than the Contractor or the utility installing the lines.

b. Pressure tests:

- i. After the pipe is laid, the joints completed, and the trench backfilled, subject the newly laid piping and valved sections of the piping to the test pressure as specified above.
- ii. Open and close each valve within the section being tested several times during the test period.
- iii. Replace or remake joints showing leakage.
- iv. Remove cracked pipe, defective pipe, and cracked or defective joints, fittings, and valves. Replace with sound material and repeat the test until results are satisfactory.
- v. Make repair and replacement without additional cost to the Owner.

c. Leakage test:

- vi. Conduct leakage test after the pressure test has been completed satisfactorily.
- vii. Duration of each leakage test: At least two hours.
- viii. During the test, subject water lines to the test pressure specified in Part A above.
- ix. Leakage is defined as the quantity of water to be supplied into the newly laid pipe, or any valved or approved section thereof, necessary to maintain the specified leakage test pressure after the pipe has been filled with water and the air expelled.
- x. No piping installation will be accepted until the leakage is less than the number of gallons per hour as determined by the formula(s):

- 1) The formulas to be used for calculating the allowable leakage per hour shall be:

$$L = \frac{SD\sqrt{P}}{148000}$$

L = allowable leakage in gallons per hour;  
 S = length of pipe tested in feet;  
 D = nominal diameter of pipe in inches; and  
 P = average test pressure psi gauge.

- xi. When testing against closed metal-seated valves, an additional leakage per closed valve of 0.0078 gallons per hour per inch of nominal valve size will be allowed.

- 1) Should any test of pipe disclose leakage greater than that Specified above, locate and repair the defective joint or joints until the leakage is within the specified allowance, and at no additional cost to the Owner.
  - 2) Repair all visible leaks regardless of test results.
7. Bedding, Backfilling, and Compaction – Continuous and uniform bedding shall be provided for all buried pipe. All trenches and excavation shall be backfilled immediately after pipes are laid therein, unless other protection of the pipeline is directed. The backfilling material shall be selected and deposited with special reference to future safety of the pipes. The material shall be completely void of rocks, stones, bricks, roots, sticks, or any other debris causing damage to pipe and tubing or preventing proper compaction of backfill. Except where special methods of bedding and tamping are provided for, clean earth or sand shall be solidly tamped about pipe up to a level at least 2-feet above top of pipes, and shall be carefully deposited to uniform layers, each layer solidly tamped or rammed with proper tools to not injure or disturb the pipeline. The remainder of trench backfilling shall be carried on simultaneously on both sides of pipe in such manner preventing injurious side pressure. Material used shall be selected from excavations anywhere on site if any of the soil is suitable. Stones, other than crushed bedding, shall not come in contact with the pipe and shall not be within 6-inches of any pipe.

Under traffic areas, the top 24-inches of backfill material shall be compacted to a density of not less than 98% of maximum laboratory density at optimum moisture as determined by ASTM D 6938. Below the 24-inch line, and including area around pipe, density shall not be less than 95% of maximum laboratory density, at optimum moisture. In areas other than traffic areas, the backfill shall be compacted to 98% of maximum laboratory density at optimum moisture.

REFERENCE ONLY

Whenever trenches have not been properly filled, or if settlement occurs, they shall be refilled, smoothed off, and finally made to conform to the ground surface. Backfilling shall be carefully performed, and the original surface restored to full satisfaction of Engineer immediately after installation.

8. Detection Tape – Detection tape will be used over all pipe and tubing. The tape shall be laid 18-inches below finished grade.
9. Tracing Wire – Tracing wire will be installed on all water mains and water service laterals directly on top of the water line. The wire shall be secured to the pipe with tape or other acceptable methods at spacings of no more than 36-inches apart. Where water service laterals connect to water mains, the wire insulation shall be stripped so bare wires can and shall be jointed securely together and wrapped with a rubberized insulation tape. The insulated wire must maintain electrical continuity. The tracing wire shall also be stubbed up into each valve box and at each fire hydrant. Stub up connections shall be stripped, joined and wrapped as previously described for water service laterals. This tracing wire system

shall be checked and tested by Contractor, in the presence of Engineer or water department, prior to acceptance of water main installation. All equipment, meters, detectors, etc., needed for testing shall be furnished by the Contractor.

10. Lubricants – Lubricate pipe before jointing per manufacturer's recommendations using acceptable lubricants. Lubricants that will support microbiological growth shall not be used. Vegetable shortening shall not be used to lubricate joints.
11. Hydrant drains shall not be connected to or located within 10-feet of sanitary sewers. No flushing device shall be directly connected to any sewer.

### **3.3 AIR RELEASE, AIR/VACUUM AND COMBINATION AIR VALVES**

OMITTED

### **3.4 CONNECTIONS OF WATER MAINS**

- A. Any physical connection of untested water mains with existing water mains is prohibited except when acceptable backflow prevention devices have been installed and checked by Engineer or Engineer's Representative.
  1. Any new water main to be tested must be capped and restrained with retaining glands or thrust blocks to prevent blow out or leakage during the pressure testing.
  2. Water for filling or flushing a new water main will be obtained through a Temporary Jumper Connection to the existing main. Appropriate taps of sufficient size must be made at the end of new system to allow air to escape during filling sequence.
  3. This physical tie-in with the existing system must be physically disconnected after sufficient water for hydrostatic testing and disinfection has been obtained.
  4. Once the new water system has demonstrated adequate hydrostatic testing and has been flushed and chlorinated in accordance with paragraph 3.5, the new system or main will then be subjected to bacteriological testing.
  5. Permanent connection to the new system must be made with clean materials. The connection may be made with either solid or split ductile iron sleeves. Any connection with stainless steel or similar metal full circle clamps is prohibited. Once connection has been made, the new system must be flushed using water from existing system to insure adequate flow and velocity into new water system.

REFERENCE ONLY

### 3.5 DISINFECTION

#### A. General:

1. Upon completion of testing, sterilize all water lines to meet requirements of the South Carolina Department of Health and Environmental Control.
2. Newly laid valves and other appurtenances shall be operated several times while line is filled with chlorinating agent.
3. Should initial treatment fail to meet results specified, repeat procedures until satisfactory results are obtained, at no additional cost to the Owner.
4. All pipe taps, feeders, chemicals, etc., for sterilization shall be provided by the Contractor.

#### B. Procedure:

1. Flush line to extent possible with available pressure and outlets, prior to sterilization.
  - a. Hydrant openings required to produce proper flushing velocity at 40 psi are:

Pipe Size (Inches)	Hydrant Openings
4 through 12	one 2-1/2"
14 through 18	two 2-1/2"
20	one 4-1/2"

2. Comply with the latest revision of AWWA C651 and the following:

- a. Apply chlorine as liquid chlorine or chlorine compound such as calcium hypochlorite with known chlorine content.
- b. Apply through corporation cock in top of main located no greater than ten (1) sections from the beginning of section being sterilized.
- c. Water from the existing distribution system or other source of supply shall be controlled so as to flow slowly into the newly laid pipeline during the application of chlorine.
- d. Use proper feeder and flow regulator to introduce chlorinating agent.
- e. Application rate shall be not less than 25 ppm and no greater than 50 ppm.
- f. Retain chlorinated water in main not less than 24 hours.
- g. At end of retention period, at least 10 ppm of chlorine shall remain in the water at the extreme end of section.
- h. Dechlorinate and flush line thoroughly.

- i. Prior to sampling, the chlorine residual must be reduced to normal system residual levels or be non-detectable in those systems not chlorinating.

C. Acceptance:

1. Provide two separate samples for each sample location, taken at 24-hour intervals, free of coliform bacteria.
  - a. Contractor to take 1st and 2nd samples, deliver to South Carolina Department of Health and Environmental Control (SCDHEC) approved laboratory for testing.
  - b. The first and second sample results shall include the free chlorine residual at the time the samples were collected.
  - c. Notify SCDHEC to take a 3rd sample.
2. If the membrane filter method of analysis is used for the coliform analysis, non-coliform growth must also be reported.
3. If the non-coliform growth is greater than eighty (80) colonies per one hundred (100) milliliters, the sample result is invalid and must be repeated.
4. At a minimum, sample locations shall be as required by SCDHEC and the following:
  - a. The tie-in location of new and existing water lines.
  - b. The end of all dead-end lines.
  - c. At intervals of no more than 1,200' for all new lines longer than 1,200' in length.
5. All sample locations are to be given an identifying label and a corresponding identification label is to be included on the record drawings indicating each sample location.

REFERENCE ONLY

### 3.6 DECHLORINATION OF CHLORINATED STERILIZATION WATER

- A. Dechlorinate the chlorinated water used for sterilizing water lines.
- B. Apply dechlorinating agent as liquid sulfur dioxide or sulfite salts.
- C. Prepare mixing chamber using a 55-gallon tank. Feed the discharge and dechlorinating agent at the bottom of the tank with overflow at the top.
- D. Discharge total chlorine residual to be less than 0.5 milligrams per liter.

### 3.7 PARTIAL ACCEPTANCE OF THE WORK

- A. Owner reserves right to accept and use any portion of the work. Engineer shall have power to direct on what line Contractor shall work and the order thereof.

### 3.8 GRASSING

- A. Grassing of areas disturbed during construction shall be in accordance with the Section 02902 "Grassing."

### 3.9 SEPARATION BETWEEN WATER AND SANITARY SEWER OR FORCE MAIN

- A. Water mains shall be laid at least 10-feet horizontally from any existing or proposed sanitary sewer or force main. Deviation may be allowed for installation of the water main closer to a sanitary sewer or force main, provided water main is laid in a separate trench, where bottom of water main is at least 18-inches above top of sanitary sewer or force main. Water mains crossing sanitary sewers or force mains shall be laid to provide a minimum vertical distance of 18-inches between the invert of water main and top of sanitary sewer or force main line; both water and sanitary sewer or force main lines must be ductile iron when laid in violation of separation requirements. At all water and sanitary sewer or force main crossings, one full length of water pipe shall be located so both joints will be as far from the sanitary sewer or force main as possible.
- B. Sewer Manholes: No water pipe shall pass through or come in contact with any part of a sewer manhole. Water lines may come in contact with storm sewers or catch basins if there is no other practical alternative, provided that ductile iron is used, no joints of the water line are within the storm sewer or catch basin and the joints are located as far as possible from the storm sewer or catch basin.
- C. Drain-fields and Spray-fields: Potable water lines shall not be laid less than 25 feet horizontally from any portion of a waste-water tile-field or spray-field or shall be otherwise protected by an acceptable method approved by the Department.
- D. When it is impossible to obtain distances specified in Section R.61-58.4(D)(12)(a) and (b) of the State Primary Drinking Water Regulations, an alternate, SCDHEC accepted design may be allowed. The alternate design must:
1. maximize distances between the water main and sewer line and joints of each;
  2. use materials which meet requirements cited in Section R.61-58.4(D)(1) of the State Primary Drinking Water Regulations for sewer line; and
  3. Allow enough distance to make repairs to one of the lines without damaging other.

### 3.10 REMOVE AND REPLACE PAVEMENT

OMITTED

### 3.11 FIELD QUALITY CONTROL

- A. Soil and density tests shall be made by a testing laboratory acceptable to Engineer. Laboratory tests of the soil shall be made in accordance with ASTM D

698. In-place density tests shall be made in accordance with ASTM D 6938. Results of tests shall be furnished to the Engineer.

The minimum number of tests required shall be:

Backfill over pipe  
in traffic areas. . . . . 1 per 100-linear feet or less for each 4-feet of depth or  
portion thereof.

Backfill over pipe  
in non-traffic areas. . . . 1 per 500-linear feet or less for each 4-feet of depth or  
portion thereof.

The minimum percent of backfill compaction, in accordance to ASTM D698, shall be the following:

In traffic Areas. . . . . 98% of maximum laboratory density.

In non-traffic Areas. . .98% of maximum laboratory density, unless otherwise  
accepted by the Engineer.

**END OF SECTION**

**REFERENCE ONLY**

**INDEX TO**  
**SECTION 02720 – STORM DRAINAGE**

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REFERENCE ONLY

**SECTION 02720**  
**STORM DRAINAGE**

**PART 1 – GENERAL**

**1.1 SECTION INCLUDES**

- A. Construction of pipes, drainage inlets, manholes, headwalls, and various drainage structures.

**1.2 RELATED SECTIONS**

- A. Section 02210 – Soil Erosion Control
- B. Section 02204 – Earthwork
- C. Section 02231 – Aggregate Base Course
- D. Section 02512SC - Asphaltic Concrete Binder Surface Courses (SC)
- E. Section 02667SC - Water Distribution System (SC)
- F. Section 02731 - Wastewater Collection System
- G. Section 03305 – Site Concrete

**1.3 OPTIONS**

- A. The bid form and specifications describe several pipe materials. Owner will select the one to be used. Where manufacturers of material or equipment are named in the specifications, Contractor may use equipment or materials of other manufacturers provided they are reviewed and accepted by Engineer as equivalent to those specified.

**1.4 REFERENCES (Latest Revision)**

- A. ASTM D 3740 – Minimum Requirements for Agencies Engaged in Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction.
- B. ASTM E 329 – Agencies Engaged in Construction Inspection and/or Testing.
- C. ASTM C 76 – Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe.
- D. ASTM C 443 – Joints for Concrete Pipe and Manholes, Using Rubber Gaskets.
- E. ASTM B 745/B 745M – Corrugated Aluminum Pipe for Sewers and Drains.
- F. ASTM D 1056 – Flexible Cellular Materials – Sponge or Expanded Rubber.

- G. ASTM F 2306/F 2306M – 12 to 60-Inch (300 to 1,500 mm) Annular Corrugated Profile-Wall Polyethylene (PE) Pipe and Fittings for Gravity-Flow Storm Sewer and Subsurface Drainage Applications.
- H. ASTM F 2306/F 2306M – 12 to 60-Inch (300 to 1,500 mm) Annular Corrugated Profile-Wall Polyethylene (PE) Pipe and Fittings for Gravity-Flow Storm Sewer and Subsurface Drainage Applications.
- I. ASTM D 1751 – Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Non-extruding and Resilient Bituminous Types).
- J. ASTM D 1752 – Preformed Sponge Rubber Cork and Recycled PVC Expansion Joint Fillers for Concrete Paving and Structural Construction.
- K. ASTM D 2321 – Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity Flow Applications.
- L. ASTM C 150 – Portland Cement.
- M. ASTM C 144 – Aggregate for Masonry Mortar.
- N. ASTM C 207 – Hydrated Lime for Masonry Purposes.
- O. ASTM C 62 – Building Brick (Solid Masonry Units Made from Clay or Shale).
- P. ASTM C 55 – Concrete Brick.
- Q. ASTM C 478 – Precast Reinforced Concrete Manhole Sections.
- R. ASTM C 1433 – Precast Reinforced Concrete Monolithic Box Sections for Culverts, Storm Drains, and Sewers.
- S. ASTM D 698 – Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort.
- T. ASTM D 6938 – In Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth).
- U. ASTM F 405 – Corrugated Polyethylene (PE) Tubing and Fittings.
- V. ASTM C 913 – Precast Concrete Water and Wastewater Structures.
- W. ASTM D 3212 – Joints for Drain and Sewer Plastic Pipes Using Flexible Elastomeric Seals.
- X. ASTM F 477 – Elastomeric Seals (Gaskets) for Joining Plastic Pipe.
- Y. AASHTO M 294 – Corrugated Polyethylene Pipe, 300 to 1500-mm Diameter.
- Z. ASTM F667 – Large Diameter Corrugated Polyethylene Pipe and Fittings.

REFERENCE ONLY

## 1.5 QUALITY ASSURANCE

- A. Material Review – Contractor will furnish the Engineer and Owner a description of all material before ordering. Engineer will review the Contractor's submittals and provide in writing an acceptance or rejection of material.
- B. Manufacturer – Material and equipment shall be standard products of a manufacturer who has manufactured them for a minimum of 2-years and provides published data on their quality and performance.
- C. Subcontractor – A subcontractor for any part of the work must have experience on similar work, and if required, furnish Engineer with a list of projects and Owners or Engineers who are familiar with their competence.
- D. Design – Devices, equipment, structures, and systems not designed by Engineer and Contractor wishes to furnish, shall be designed by either a Registered Professional Engineer or by someone the Engineer accepts as qualified. If required, complete design calculations and assumptions shall be furnished to the Engineer or Owner before ordering.
- E. Testing Agencies – Soil tests shall be taken by a testing laboratory operating in accordance to ASTM D-3740 and E-329 and be acceptable to the Engineer prior to engagement. Mill certificates of tests on materials made by manufacturers will be accepted provided the manufacturer maintains an adequate testing laboratory, makes regularly scheduled tests, spot checked by an outside laboratory and furnishes satisfactory certificates.

## 1.6 PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. Material shall be unloaded in a manner avoiding damage and shall be stored where it will be protected and will not be hazardous to traffic. Contractor shall repair any damage caused by the storage. Material shall be examined before installation. Neither damaged nor deteriorated material shall be used in the work.

## 1.7 SEQUENCING AND SCHEDULING

- A. Contractor shall arrange work so sections of pipes between structures are backfilled, checked, pavement replaced, and the section placed in service as soon as reasonable after installation.

## 1.8 ALTERNATIVES

- A. The intention of these specifications is to produce the best system for the Owner. If Contractor suggests alternate material, equipment or procedures will improve results at no additional cost, the Engineer and Owner will examine suggestion, and if accepted, it may be used. The basis upon which acceptance of an alternate will be given is its value to Owner and not for Contractor's convenience.

## 1.9 GUARANTEE

- A. Contractor shall guarantee quality of materials, equipment, and workmanship for a minimum period of 12 months or as required by the local governing agency after acceptance. Defects discovered during this period shall be repaired by Contractor at no cost to the Owner.

## 1.10 EXISTING UTILITIES

- A. All known utility facilities are shown schematically on the construction drawings and are not necessarily accurate in location as to plan or elevation. Utilities such as service lines or unknown facilities not shown, will not relieve the Contractor of responsibility under this requirement. "Existing Utilities Facilities" means any utility existing on the project in its original, relocated, or newly installed position. Contractor will be held responsible for cost of repairs to damaged underground facilities; even when such facilities are not shown on the drawings.
- B. The Contractor shall call for underground utility locations before starting work. Underground utilities location service can be contacted at 1-888-721-7877 (SC).

## 1.11 MEASUREMENT AND PAYMENT

- A. Pipe Culverts and Storm Drains – Length of pipe will be paid for on a linear foot basis, as measured along the centerline, from end of pipe to end of pipe, end of pipe to center of structure or center of structure to center of structure. Payment of which will constitute full payment for all pipe, joints, filter fabric and bedding, including trenching, dewatering, excavation, shoring, backfill and compaction, surface clean-up, and all incidental labor and material necessary to complete the construction of pipe as required by this section of specifications.
- B. Drainage Structures – Payment will be made on a contract unit price basis. Payment will constitute full payment for all dewatering, excavation, shoring, formwork, precast concrete, backfill, compaction, frames, gratings or covers, concrete, brick and all miscellaneous materials, surface clean-up and labor necessary to complete the construction.
- C. Headwalls – Payment will be made on a contract unit price of each type. Payment will constitute full compensation for dewatering, excavation, shoring, formwork, all materials, and incidentals necessary to complete the construction.
- D. Beveled End Section – Payment will be made on a contract unit price of each type. Payment will constitute full compensation for dewatering, excavation, shoring, formwork, all materials, and incidentals necessary to complete the construction.
- E. Sheeting and Bracing – Will not be measured for direct payment. All costs and charges in connection therewith shall be reflected and included in the item of work to which it pertains.
- F. Subgrade Drain – Payment will be made at the contract unit price per linear foot. Payment will constitute full payment for trenching, furnishing and installing

perforated drain pipe with sock, furnishing and placing fine aggregate, proper backfilling, surface cleanup, acceptable connection to structures, and all work necessary to make the installation complete.

### 1.12 TESTING

- A. Laboratory tests for moisture density relationship for fill materials shall be in accordance with ASTM D 698 (Standard Proctor).
- B. In place density tests in accordance with ASTM D 1556 or ASTM D 6938.
- C. Testing laboratory shall operate in accordance with ASTM D 3740 and E 329 and be acceptable to the Engineer.
- D. Testing laboratory and Project Engineer/Project Representative shall be given a minimum of 48-hours notice prior to taking any tests.
- E. Owner shall select and engage the testing laboratory. Testing laboratory shall be responsible to the Owner and Owner's Engineer. Payment for laboratory and all tests shall be by Owner, except Owner specifically reserves the right to deduct from Contractor's payment, expenses and charges of testing laboratory when:
  - 1. Contractor gives notice work is ready for inspection and testing, and fails to be ready for the test, and/or
  - 2. testing of the Contractor's work, products, or materials fail, and retesting is required, and/or
  - 3. Contractor abuses the services or interferes with work of testing laboratory in conduct of this work.
- F. Test results shall be furnished to the Engineer prior to continuing with associated or subsequent work.

REFERENCE ONLY

## PART 2 – PRODUCTS

### 2.1 PIPE

- A. Concrete Pipe – Shall be reinforced Class III, Class IV, or Class V and shall conform to ASTM Specification C-76. Pipe less than 48 inch inside diameter shall be manufactured without lifting holes. Joints shall be 'O' ring watertight flexible rubber as indicated on the plans.
  - 1. 'O' Ring Joints – Shall be watertight flexible rubber gasket and shall meet ASTM Specification C-443.
- B. Subgrade Drain – Shall be heavy duty corrugated polyethylene perforated pipe manufactured by Advanced Drainage Systems (ADS) or equivalent and shall conform to ASTM F-405.

### 2.2 DRAINAGE STRUCTURES

- A. Details – See plans.
- B. Concrete – Reinforced and non-reinforced.
1. Minimum compressive strength = 3,000-p.s.i. at 28-days.
  2. Reinforcing shall be covered by a minimum 1-inch of concrete for top slabs and 1-1/2-inches for walls and bases and 3-inches where concrete is deposited directly against the ground.
  3. Expansion joint filler materials shall conform to ASTM D 1751 or D 1752.
- C. Mortar – Connection of pipe and drainage structures shall be composed of one part by volume of Portland cement and two parts of sand. The Portland cement shall conform to ASTM C-150, Type I or II. The sand shall conform to ASTM C-144 and shall be of an accepted gradation. Hydrated lime may be added to the mixture of sand and cement in an amount equal to 25% of cement volume used. Hydrated lime shall conform to ASTM C-207, Type S. Quantity of water in the mixture shall be sufficient to produce a workable mortar but shall in no case exceed 7 gallons of water per sack of cement. Water shall be clean and free of harmful acids, alkalies, and organic impurities. The mortar shall be used within 30 minutes from time ingredients are mixed with water.
- D. Brick Masonry – Brick shall conform to ASTM Specification C-62, Grade SW or C-55, Grade S. Mortar for jointing and plastering shall consist of one-part Portland cement and two parts fine sand. Lime may be added to the mortar in an amount not more than 25% of the cement volume used. Joints shall be completely filled and shall be smooth and free from surplus mortar on the inside of structure. Brick structures shall be plastered with ½-inch of mortar over entire outside surface of the walls. For square or rectangular structures, brick shall be laid in stretcher courses with a header course every sixth course, and for round structures, brick shall be laid radially with every sixth course a stretcher course.
- E. Precast – Shall be constructed in accordance with ASTM C-478, C-913, or C-1433 and conform to details on the project drawings.
1. Joints – Shall be tongue and groove sealed with flexible gaskets or mastic sealant. Gaskets shall be O-Ring or Type A or B “Tylox” conforming to ASTM C443 and mastic shall be “Ram-nek” or equivalent with primer. Primer shall be applied to all contact surfaces of manhole joints at the factory in accordance with manufacturer’s instructions.
  2. Steps – Shall be polypropylene equivalent to M.A. Industries, Type PS-1 or PS-1-PF. Steps shall be installed at the manhole factory and in accordance with recommendations of step manufacturer. Manholes will not be acceptable if steps are not installed accordingly.
  3. Leaks – No leaks in the manhole will be acceptable. All repairs made from inside the manhole shall be made with mortar composed of one-part Portland cement and two parts clean sand; mixing liquid shall be straight bonding agent equivalent to “Acryl 60.”

- F. Frame, cover & grating shall conform to details shown on the project drawings. Grates in pavement and in other flush-mounted type surfaces shall be of a "bicycle-safe" configuration consisting of 45-degree diagonal bars or slotted grates with a maximum clear opening of 1-inch and a maximum length of 9-inches. In any case, the long dimension of openings should be located transverse to direction of traffic when possible.

### 2.3 FILTER FABRIC

- A. Shall be a non-woven heat-bonded fiber of polypropylene and nylon filaments equivalent to Mirafi 140 N. The fabric shall be finished so filaments will retain their relative position with respect to each other. Fabric shall contain stabilizers and/or inhibitors added to the base plastic to make filaments resistant to deterioration due to ultraviolet and/or heat exposure. The product shall be free of flaws, rips, holes, or defects.

### 2.5 SOILS AND STONE AGGREGATES

- A. Stone aggregate shall be clean crushed granite or concrete meeting the gradation requirements of grade No. 57.
- B. Soils used for bedding, haunching, and initial backfill shall be as shown in the following table and shall meet requirements and classifications of ASTM D2321 and ASTM D2487.

Class	Type	Soil Group Symbol D 2487	Description	Percentage Passing Sieve Sizes		
				1-1/2 inch (40 mm)	No. 4 (4.75 mm)	No. 200 (0.075 mm)
IB	Manufactured, Processed Aggregates; dense-graded, clean.	None	Angular, crushed stone (or other Class 1A materials) and stone/sand mixtures with gradations selected to minimize migration of adjacent soils; contain little or no fines.	100%	≤50%	<5%
II	Coarse – Grained Soils, clean	GW	Well-graded gravels and gravel-sand mixtures; little or no fines.	100%	<50% of "Coarse Fraction"	<5%
		GP	Poorly-graded gravels and gravel-sand mixtures; little or no fines.		"	
		SW	Well-graded sands and gravelly sands; little or no fines.		>50% of "Coarse Fraction"	
		SP	Poorly-graded sands and gravelly sands; little or no fines.		"	
	Coarse-Grained Soils; borderline clean to w/fines.	Eg. GW-GC, SP-SM.	Sands and gravels that are borderline between clean and with fines.	100%	Varies	5% to 12%

III	Coarse-Grained Soils with Fines	GM	<i>Silty gravels, gravel-sand-silt mixtures.</i>	100%	<50% of "Coarse Fraction"	5%
		GC	<i>Clayey gravels, gravel-sand-clay mixtures.</i>			
		SM	<i>Silty sands, sand-silt mixtures.</i>		>50% of "Coarse Fraction"	
		SC	<i>Clayey sands, sand-clay mixtures.</i>			
IVA	Fine-grained soils (inorganic)	ML	<i>Inorganic silts and very fine sands, rock flour, silty or clayey fine sands, silts with slight plasticity.</i>	100%	100%	>50%
		CL	<i>Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays.</i>			

## 2.6 PRODUCT REVIEW

- A. Contractor shall provide the Engineer with a complete description of all products before ordering. Engineer will review all products by the submittal of shop drawings before they are ordered.

## PART 3 – EXECUTION

### 3.1 ON SITE OBSERVATIONS OF WORK

- A. The line, grade, deflection, and infiltration of storm sewers shall be tested by Contractor under direction of Engineer. Owner's Representative or Engineer will have the right to require any portion of work be completed in their presence and if work is covered up after such instruction, it shall be exposed by Contractor for observation. However, if Contractor notifies Engineer such work is scheduled and the Engineer fails to appear within 48-hours, Contractor may proceed. All work completed, and material furnished shall be subject to review by the Engineer or Project Representative. All improper work shall be reconstructed. All materials not conforming to requirements of specifications shall be removed from the work upon notice being received from Engineer for rejection of such materials. Engineer shall have the right to mark rejected materials to distinguish them as such.

Contractor shall give the Project Engineer or Project Representative a minimum of 48-hours' notice for all required observations or tests. Storm sewers shall be dry for observation by the Engineer. Lines under water shall be pumped out by Contractor prior to observation, at no additional cost to the Owner.

It will also be required of Contractor to keep accurate, legible records of the location of all storm sewer lines and appurtenances. These records will be prepared in accordance with paragraph on "Record Data and Drawings" in the Special Conditions. Final payment to the Contractor will be withheld until all such information is received and accepted.

### 3.2 EXCAVATION FOR PIPE AND STRUCTURES

- A. Excavated material shall be piled a sufficient distance from the trench banks to avoid overloading to prevent slides or cave-ins.
- B. Remove from site all material not required or suitable for backfill.
- C. Grade as necessary to prevent water from flowing into excavations.
- D. Remove all water accumulating in the excavation, from surface flow, seepage, or otherwise, by pumping or other acceptable method.
- E. Sheet piling, bracing or shoring shall be used as necessary for protection of the work and safety of personnel.

### 3.3 TRENCHING FOR PIPE

- A. Trenching for Pipe – The width of trenches at any point below top of pipe shall be not greater than outside diameter of pipe plus 4-feet to permit satisfactory jointing and thorough bedding, haunching, backfilling and compacting under and around pipes. Sheet piling and bracing where required shall be placed within the trench width as specified. Care shall be taken not to over-excavate. Where trench widths are exceeded, redesign with a resultant increase in cost of stronger pipe or special installation procedures shall be necessary. Cost of this re-design and increased cost of pipe or installation shall be borne by Contractor without additional cost to the Owner. When installing pipe in a positive projecting embankment installation, the embankment shall be installed to an elevation of at least 1 foot above top of pipe for a width of five pipe diameters on each side of pipe before installation of pipe.

**REFERENCE ONLY**

- B. Removal of Unsuitable Material – Where wet or otherwise unstable soil, incapable of supporting the pipe is encountered in bottom of trench, such material shall be removed to depth required and replaced to proper grade with stone or sand foundation as determined by Engineer. This foundation shall be compacted to 95% standard proctor.

### 3.4 PROTECTION OF UTILITY LINES

- A. Existing utility lines shown on drawings or locations of which are made known to the Contractor prior to excavation, and are to be retained, as well as utility lines constructed during excavation operations, shall be protected from damage during excavation and backfilling, and if damaged, shall be repaired at Contractor's expense. If the Contractor damages any existing utility lines not shown on drawings or locations of which are not known to Contractor, report thereof shall be made immediately. If Engineer determines repairs shall be made by Contractor, such repairs will be ordered under the clause in GENERAL CONDITIONS of contract entitled "CHANGES." When utility lines to be removed are encountered within the area of operations, Contractor shall notify Engineer in ample time for necessary measures taken to prevent interruption of service.

### 3.5 FOUNDATION AND BEDDING

- A. Stone Foundation – Where the subgrade of pipe is unsuitable material, Contractor shall remove unsuitable material to a depth determined by Engineer or Geotechnical Consultant and furnish and place stone foundation in trench to stabilize subgrade.
- B. Sand Foundation – Where the character of soil is unsuitable, even though dewatered, additional excavation to a depth determined by Engineer or Geotechnical Consultant shall be made and replaced with clean sand furnished by Contractor.
- C. Bedding for pipe shall provide a firm surface of uniform density throughout the entire length of pipe. Before laying pipe, trench bottom shall be de-watered by the use of well points. Where well points will not remove the water, Contractor shall construct sumps and use pumps to remove all water from bedding surface. Pipe shall be carefully bedded in stone accurately shaped and rounded to conform to lowest 1/3 outside portion of circular pipe, or lower curved portion of arch pipe for the entire length of pipe. Bell holes and depressions for joints shall be only of such length, depth, and width as required for properly making the particular type joint.
- D. Concrete Pipe:
1. Materials for bedding concrete pipe shall be either Class II, Class III, or Class IB if processed, to minimize migration of adjacent material.
  2. Depth of bedding shall be equal to 1/24 the outer diameter of pipe or 3 inches, whichever is greater.
  3. Bedding area under the center of pipe, for a width 1/3 outer diameter of pipe, known as middle bedding, shall be loosely placed. Remainder of bedding for full width of the trench shall be compacted to a minimum density of 85% for Class II bedding and 90% for Class III bedding as determined by ASTM D1557.

REFERENCE ONLY

### 3.6 HAUNCHING, INITIAL BACKFILL, AND FINAL BACKFILL

- A. Haunching – After the bedding has been prepared and pipe is installed, Class II or Class III soil shall be placed along both sides of pipe, in layers not exceeding 6-inches in compacted depth. Care shall be taken to insure thorough compaction and fill under haunches of the pipe. Each layer shall be thoroughly compacted with mechanical tampers and rammers. Haunching shall extend up to the spring line of pipe and be compacted to following densities:
1. RCP: Minimum density shall be 90% as determined by ASTM D698.
- B. Final Backfill – For all pipes, it should extend to the surface and shall be select materials compacted to a minimum of 98% as determined by ASTM D698 if pipe is under pavement. If pipe is in grassed areas final backfill may be native materials compacted to a minimum density of 90% as determined by ASTM D698.

### 3.7 PLACING PIPE

- A. Each pipe shall be carefully examined before being laid, and defective or damaged pipe shall not be used. Pipelines shall be laid to the grades and alignment indicated. Proper facilities shall be provided for lowering sections of pipe into trenches. Under no circumstances shall pipe be laid in water, and no pipe shall be laid when trench conditions or weather are unsuitable for such work. Diversion of drainage or dewatering of trenches during construction shall be provided as necessary. All pipe in place shall have been checked before backfilling. When storm drainpipe terminates in a new ditch, headwall or end section, together with ditch pavement, if specified, shall be constructed immediately as called for on the plans. Ditch slopes and disturbed earth areas shall be grassed and mulched as required. Contractor will be responsible for maintaining these newly constructed ditches and take immediate action subject to acceptance, keeping erosion of the ditch bottom and slopes to a minimum during life of contract. No additional compensation will be given to Contractor for the required diversion of drainage and/or dewatering of trenches. Grassing the trench backfill shall conform to requirements of Section 02902 – “Grassing.”
- B. Concrete Pipe: Laying shall proceed upgrade with spigot ends of bell and spigot pipe and tongue ends of tongue and groove pipe pointing in the direction of flow. Place pipe in trench with the invert conforming to required elevations, slopes, and alignment. Provide bell holes in pipe bedding in order to insure uniform pipe support. Fill all voids under the pipe by working in backfill material.
- D. Subgrade Drain Tubing – Shall be laid as detailed on construction drawings with the invert conforming to required elevations and alignment.
- E. Tracing Wire – Tracing wire will be installed on all subgrade drain directly on top of the pipe. The wire shall be secured to pipe with tape or other acceptable methods at spacings of no more than 36-inches apart. Where subgrade drains branch off from main lines, the wire insulation shall be stripped so bare wires can and shall be jointed securely together and wrapped with a rubberized insulation tape. The insulated wire must maintain electrical continuity. The tracing wire shall also be stubbed up into each drainage structure. This tracing wire system shall be checked and tested by Contractor, in presence of Engineer, prior to acceptance of the installation. All equipment, meters, detectors, etc., needed for testing shall be furnished by the Contractor.

### 3.8 JOINTS IN PIPES

- A. Concrete Pipe – Joints in concrete pipe shall be either 'O' ring watertight flexible rubber or tongue and groove as indicated on the plans. Gasketed, single offset joints may be used if accepted by the Engineer. Maintain pipe alignment and prevent infiltration of fill material at joints during installation.
1. 'O' ring joints shall meet the requirements of ASTM C443. They shall utilize either a rubber gasket with a circular cross section or a rectangular cross section. Gaskets shall have no more than one splice, except two splices of the gasket will be permitted if nominal diameter of pipe exceeds 54-

inches. Manufacturer's recommendations and requirements shall be followed.

- 2. All concrete pipe joints shall receive one layer of filter fabric completely around exterior of the joint. Filter fabric shall be a minimum of 2-feet wide, centered on the joint, and overlapped a minimum of 1-foot.

- D. Subgrade Drain Tubing – Joints shall be joined using snap couplings. When installing sock wrapped pipe, overlap sock ends over coupling and secure with polyethylene tape.

**3.9 FIELD QUALITY CONTROL**

- A. Soil and density tests shall be made by a testing laboratory acceptable to the Engineer. Laboratory tests of the soil shall be made in accordance with ASTM D 698. In-place density tests shall be made in accordance with ASTM D 6938. Results of tests shall be furnished to the Engineer.

The minimum number of tests required shall be:

Haunching and Initial Backfill in all areas....	1 per 100-linear feet of pipe, minimum of one per run of pipe for both the haunching and initial backfill zones.
Final Backfill over pipe in traffic areas.....	1 per 100-linear feet or less for each 4-feet of depth or portion thereof.
Final Backfill over pipe in non-traffic areas.....	1 per 500-linear feet or less for each 6-feet of depth or portion thereof.

REFERENCE ONLY

The minimum percent of compaction of the backfill material (in accordance to ASTM D698) shall be the following:

In traffic Areas. . . . . 98% of maximum laboratory density.

In non-traffic Areas . . . . . 98% of maximum laboratory density, unless otherwise accepted by the Engineer.

- B. It is the Contractor's responsibility to assure backfill is sufficient to limit pipe deflection to no more than 5%. When flexible pipe is used, a deflection test shall be made by the Contractor on entire length of installed pipeline, not less than 30-days after completion of all backfill and placement of any fill. Deflection shall be determined by use of a deflection device or by use of a spherical, spheroidal, or elliptical ball, a cylinder, or circular sections fused to a common shaft. The ball, cylinder, or circular sections shall have a diameter, or minor diameter as applicable, of 95% the inside pipe diameter. The ball, cylinder, or circular sections shall be of a homogeneous material throughout, shall have a density greater than 1.0 as related to water at 39.2 degrees F, and shall have a surface brinell hardness of not less than 150. The device shall be center bored and through bolted with a 1/4-inch minimum diameter steel shaft having a yield strength of 70,000 p.s.i. or more, with eyes at each end for attaching pulling cables. The eye

shall be suitably backed with flange or heavy washer; a pull exerted on opposite end of shaft shall produce compression throughout remote end of ball, cylinder, or circular section. Circular sections shall be spaced so the distance from external faces of front and back sections shall equal or exceed diameter of circular section. Failure of the ball, cylinder, or circular section to pass freely through a pipe run, either by being pulled through by hand or by being flushed through with water, shall be cause for rejection of a run. When a deflection device is used for the test in lieu of a ball, cylinder, or circular sections described, such device shall be given acceptance prior to use. Device shall be sensitive to 1.0% of pipe diameter being measured and shall be accurate to 1.0% of the indicated dimension. Installed pipe showing deflections greater than 5% of normal pipe diameter shall be retested by a run from the opposite direction. If retest also fails, the suspect pipe shall be repaired or replaced at no cost to Owner.

- C. 50% of pipes under roadways shall be televised and video recorded. The video observation shall include a complete pan view of each joint. If the video observation indicates problems, further televising may be required. Additional televising and video recording will be at no additional cost to the Owner.

### **3.10 DRAINAGE STRUCTURES**

- A. Drainage structures shall be constructed of materials specified for each type and in accordance with details shown on the drawings.

### **3.11 REMOVE AND REPLACE PAVEMENT**

- A. Pavement shall only be removed after prior written authorization by the Owner. Pavement removed and replaced shall be constructed in accordance with latest specifications of the State Department of Transportation. Traffic shall be maintained and controlled per State Department of Transportation regulations.

### **3.12 CONNECT PIPE TO EXISTING STRUCTURES**

- A. Contractor shall connect pipe to the existing structure where indicated. For brick or precast structures, a hole not more than 4-inches larger than outside diameter of new pipe shall be cut or cored neatly in the structure, new pipe laid so it is flush with inside face of structure, and annular space around pipe filled with a damp, expanding mortar or grout to make a watertight seal.

**END OF SECTION**

**INDEX TO**  
**SECTION 02731 – WASTEWATER COLLECTION SYSTEM**

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REFERENCE ONLY

**SECTION 02731**  
**WASTEWATER COLLECTION SYSTEM**

**PART 1 – GENERAL**

**1.1 SECTION INCLUDES**

- A. Sewer Pipes.
- B. Manholes.
- C. Connect to existing system.
- D. All necessary appurtenances to collect the wastewater and deliver it to the existing system.

**1.2 RELATED SECTIONS**

- A. Section 02204 – Earthwork.
- B. Section 02231 – Aggregate Base Course.
- C. Section 02512SC - Asphaltic Concrete Binder Surface Courses (SC)
- B. Section 02667 – Water Distribution System.
- C. Section 02720 – Storm Drainage.

**1.3 OPTIONS**

OMITTED

**1.4 REFERENCES (Latest Revision)**

- A. ASTM D 3740 – Minimum Requirements for Agencies Engaged in Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction.
- B. ASTM E 329 – Agencies Engaged in Construction Inspection and/or Testing.
- C. ASTM D 3034 – Type PSM Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings.
- D. ASTM D 3212 – Joints for Drain and Sewer Plastic Pipes Using Flexible Elastomeric Seals.
- E. ASTM F 477 – Elastomeric Seals (Gaskets) for Joining Plastic Pipe.
- F. ASTM D 3139 – Joints for Plastic Pressure Pipes Using Flexible Elastomeric Seals.
- G. ASTM C 478 – Precast Reinforced Concrete Manhole Sections.

- H. ACI 318 – Building Code Requirements for Structural Concrete.
- I. ASTM C 39/C 39M – Compressive Strength of Cylindrical Concrete Specimens.
- J. ASTM C 890 – Minimum Structural Design Loading for Monolithic or Sectional Precast Concrete Water and Wastewater Structures.
- K. ASTM C 891 – Installation of Underground Precast Concrete Utility Structures.
- L. ASTM C 913 – Precast Concrete Water and Wastewater Structures.
- M. ASTM A 615/A 615 M – Deformed and Plain Carbon – Steel Bars for Concrete Reinforcement.
- N. ANSI/AWWA C-500 – Metal-Seated Gate Valves for Water Supply Service.
- O. ANSI/AWWA C-509 – Resilient-Seated Gate Valves for Water Supply Service.
- P. ASTM D-6938 – In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth).
- Q. ASTM D-698 – Laboratory Compaction Characteristics of Soil Using Standard Effort.
- R. ASTM D 714 – Evaluating Degree of Blistering of Paints.
- S. ASTM D 2794 – Resistance of Organic Coatings to the Effects of Rapid Deformation (Impact).
- T. ASTM E 96 – Water Vapor Transmission of Materials.
- U. ASTM G 154 – Operating Fluorescent Light Apparatus for UV Exposure of Nonmetallic Materials.
- V. ASTM F 1417 – Installation Acceptance of Plastic Gravity Sewer Lines Using Low-Pressure Air.
- W. ANSI/AWWA C900 – Polyvinyl Chloride (PVC) Pressure Pipe and Fabricated Fittings, 4 Inches through 12 inches, for Water Transmission and Distribution.

REFERENCE ONLY

## 1.5 MEASUREMENT AND PAYMENT

- A. Measurement – Items listed in the proposal shall be considered as sufficient to complete work in accordance with plans and specifications. Any portion of work not listed in the bid form shall be deemed to be a part of item it is associated with and shall be included in costs of unit shown on bid form. Payment for unit shown on the bid form shall be considered satisfactory to cover cost of all labor, material including required stone or sand bedding, equipment, and performance of all operations necessary to complete work in place. The unit of measurement shall be unit shown on bid form. Payment shall be based upon the actual quantity

multiplied by unit prices. Where work is to be performed at a lump sum price, the lump sum shall include all operations and elements necessary to complete work.

B. Payment:

1. Gravity Sewer Pipe – Measurements will be made between the centers of manholes or to other pipe ends. No deduction will be made for the space occupied by fittings. Payment will be made at the contract unit price per linear foot for each pipe size at various depths of cut. Depths of cut are measured from existing ground unless otherwise noted. Payment will include cost of pipe, plugs, dewatering, excavating, shoring, all material, testing, backfilling, required stone or sand bedding, compaction, cleaning, metal detector tape, tracing wire, and all work necessary to complete the sewer lines.
2. Trench Wall Supports – No separate payment will be made for bracing and sheeting.
3. Manholes – Payment for manholes will be made at the unit price for various types and depths. Manhole depths are measured from invert to proposed finish grade unless otherwise noted. Payment shall include cost of excavating, shoring, dewatering, constructing manholes in accordance with plans, furnishing and installing a frame and cover, steps, interior and exterior coatings, pipe connectors, backfilling, and compacting material around the manhole.
4. Service Connection – Payment will be made at the contract unit price. Payment shall include the fitting, plug, and marking stake.
5. Metal Detector Tape – No separate payment will be made for tape. Cost of furnishing and placing metal detector tape shall be included in the contract unit price for installing sewer and force main pipe.
6. Tracing Wire – No separate payment will be made for wire. The cost of furnishing and placing tracing wire shall be included in the contract unit price for installing force main pipe, [sanitary sewer, and service laterals.]
7. Service Laterals – Shall be measured from center of main to the point where lateral reaches property line. Payment will include furnishing the pipe, excavation, shoring, installation, metal detector tape, tracing wire, backfilling, compaction, and all work and materials necessary to complete laterals.
8. Grassing – There will be no separate measurement or payment. Grassing shall be a subsidiary obligation of Contractor in the restoration of disturbed areas.
9. Connect Sewers to Existing Structures – Payment will be made at the contract unit price for each pipe size connected. For precast structures payment shall include cost of dewatering, excavation, shoring, coring, furnishing and installing flexible sleeve, installing and connecting pipe to sleeve, backfilling, compaction, clean-up, and all work necessary to

REFERENCE ONLY

complete the connection. For brick structures, payment shall include cost of dewatering, excavation, cutting a hole, installing and grouting in pipe, backfilling, compaction, cleanup, and all work necessary to complete the connection.

#### 1.6 QUALITY ASSURANCE

- A. Contractor will furnish the Engineer and Owner a description of all material before ordering. Engineer will review the Contractor's submittals and provide in writing an acceptance or rejection of material.
- B. Material and equipment shall be the standard products of a manufacturer who has manufactured them for a minimum of two years and provides published data on their quality and performance.
- D. A subcontractor for any part of the work must have experience on similar work, and if required, furnish Engineer with a list of projects and Owners or Engineers who are familiar with its competence.
- E. If Contractor wishes to furnish devices, equipment, structures, and systems not designed by Engineer, these items shall be designed by either a Professional Engineer registered in the project state or by someone Engineer accepts as qualified. If required, complete design calculations and assumptions shall be furnished to the Engineer or Owner before acceptance.
- F. Testing shall be by a testing laboratory which operates in accordance to ASTM D 3740 or E 329 and shall be acceptable to Engineer prior to engagement. Mill certificates of tests on materials made by manufacturers will be accepted provided the manufacturer maintains an adequate testing laboratory, makes regularly scheduled tests, spot checked by an outside laboratory, and furnishes satisfactory certificates with name of entity making test.

#### 1.7 PRODUCT DELIVERY, STORAGE & HANDLING

- A. Material shall be unloaded in a manner avoiding damage and shall be stored where it will be protected and will not be hazardous to traffic. If stored on private property, Contractor shall obtain permission from property owner and shall repair any damage caused by the storage. Material shall be examined before installation. Neither damaged nor deteriorated material shall be used in the work.

#### 1.8 JOB CONDITIONS

- A. Installation of the wastewater collection system must be coordinated with other work on site. Generally, wastewater pipes will be installed first and shall be backfilled and protected so subsequent excavating and backfilling of other utilities does not disturb them. Contractor shall replace or repair any damaged pipe or structure at no additional expense to the Owner.

**1.9 SEQUENCING AND SCHEDULING**

- A. Contractor shall arrange the work so sections of sewers between manholes are backfilled and tested, lateral sewers connected, pavement replaced, and placed in service as soon as reasonable after installation.

**1.10 ALTERNATIVES**

- A. The intention of these specifications is to produce the best system for the Owner. If the Contractor suggests alternate material, equipment or procedures will improve results at no additional cost, Engineer and Owner will examine suggestion, and if accepted, it may be used. The basis upon which acceptance of an alternate will be given is its value to Owner, and not for Contractor's convenience.

**1.11 GUARANTEE**

- A. Contractor shall guarantee quality of materials, equipment, and workmanship for 12 months after acceptance of the completed Project. Defects discovered during this period shall be repaired by Contractor at no cost to the Owner.

**1.12 EXISTING UTILITIES**

- A. All known utility facilities are shown schematically on the construction drawings and are not necessarily accurate in location as to plan or elevation. Utilities such as service lines or unknown facilities not shown will not relieve the Contractor of responsibility under this requirement. "Existing Utilities Facilities" means any utility existing on the project in its original, relocated, or newly installed position. Contractor will be held responsible for cost of repairs to damaged underground facilities, even when such facilities are not shown on the drawings.

- B. The Contractor shall call for underground utility locations before starting work. Underground utilities location service can be contacted at 1-888-721-7877 (SC) or 811.

**1.13 TESTING**

- A. Laboratory tests for moisture density relationship for fill materials shall be in accordance with ASTM D 698, (Standard Proctor).
- B. In place density tests in accordance with ASTM D 2922.
- C. Testing laboratory shall operate in accordance with ASTM D 3740 and E 329 and be acceptable to the Engineer.
- D. Testing laboratory and Project Engineer/Project Representative shall be given a minimum of 48-hours' notice prior to taking any tests.
- E. Owner shall select and engage the testing laboratory. Testing laboratory shall be responsible to the Owner and Owner's Engineer. Payment for laboratory and all tests shall be by the Owner, except Owner specifically reserves right to deduct from Contractor's payment, expenses and charges of testing laboratory when:

1. Contractor gives notice work is ready for inspection and testing, and fails to be ready for the test, and/or
  2. Testing of the Contractor's work, products, or materials fail, and retesting is required, and/or
  3. Contractor abuses services or interferes with work of the testing laboratory in conduct of this work
- F. Test results shall be furnished to the Engineer prior to continuing with associated or subsequent work.

**PART 2 – PRODUCTS**

Materials used in the work shall be those named in Bid Form. In multiple type bids, selection of material types will be at the opinion of Owner. Materials and products used shall conform to one of the following:

**2.1 SEWER PIPE**

- A. PVC Pipe – Shall be polyvinyl chloride plastic (PVC) and shall meet all requirements of ASTM D 3034 SDR 26. All sewers shall be constructed with a minimum of three (3) feet of cover, unless justified by the applicant and approved by SCDHEC (e.g., use of ductile iron pipe may have cover less than three (3) feet). All pipe shall be suitable for use as a gravity sewer conduit. Provisions must be made for contraction and expansion at each joint with a rubber gasket. Pipe sizes and dimensions shall be as shown below. All pipe shall be green or white in color with factory marked homing lines. Fittings shall meet the same specification requirements as pipe.

Nom. Size	Outside Diameter		Min. Wall Thickness
	Average	Tolerance	SDR-26
4	4.215	± 0.009	.162
6	6.275	± 0.011	.241
8	8.400	± 0.012	.323
10	10.500	± 0.015	.404
12	12.500	± 0.018	.481

Tests on PVC Pipe – Pipe shall be designed to pass all tests at 73 ° F. (± 3° F.).

**2.2 JOINTS – GRAVITY SYSTEM**

- A. Joints for PVC Pipe – Shall be integral wall bell and spigot with a rubber ring gasket. Joints shall conform to ASTM D 3212 and gaskets to ASTM F 477.

**2.3 FORCE MAIN**

OMITTED

**2.4 CASING**

OMITTED

**2.5 CASING SPACERS**

OMITTED

**2.6 MANHOLES**

- A. Masonry – Shall be new whole brick of good quality laid in masonry mortar or cement mortar made of one-part Portland cement and two parts clean sharp sand. Every brick shall be fully bedded in mortar. Manholes shall conform to locations and details shown on the plans.
- B. Precast Concrete – Shall be reinforced concrete constructed in accordance with ASTM C 478 and details shown on the plans "Precast Concrete Manholes." Coarse aggregate shall be granite stone. The joints shall be tongue and groove sealed with flexible gaskets or mastic sealant. Gaskets shall be O-Ring or equivalent to Type A or B "Tylox" conforming to ASTM C 443. Mastic shall be equivalent to "Ram-nek" with primer. Primer shall be applied to all contact surfaces of manhole joint at the factory in accordance with manufacturer's instructions.
- C. Frames and Covers – Shall be cast iron equivalent to the following:  
  
Neenah Foundry Co. R-1668 Type "C" Lid
- D. Manhole Steps – Shall be equivalent to M.A. Industries, Type PS-1 or PS-2-PF. Steps shall be installed at the manhole factory and in accordance with recommendations of step manufacturer. Manholes will not be acceptable if steps are not installed accordingly.
- E. Pipe Connections – Shall have flexible watertight joints at sewer main point of entry into the manhole. The joint shall be an EPDM or polyisoprene sleeve equivalent to "Kor-N-Seal."
- F. Coatings – New manholes shall have all interior surfaces coated with a factory applied acrylic polymer-based coating and sealant. The coating shall be ConSeal CS-55 manufactured by Concrete Sealants, New Carlisle, Ohio or an accepted equivalent. The coating shall be applied in three coats to achieve a total dry film thickness of at least 3.5 mils in accordance with manufacturer's recommendations. Surfaces shall be cleaned of all dust, form oils, curing compounds and other foreign matter prior to the coating application.
- G. No potable water pipe shall pass through or come into contact with any part of a sewer manhole.
- H. Drop manholes are required where the invert differential is 24-inches or more.
- I. Manholes shall have a minimum inside diameter of 4-feet and 5-feet with an inside drop pipe. The minimum manhole access diameter shall be 22-inches.

- J. Force mains tying onto manholes shall enter the manhole a vertical distance of not more than 2-feet above the flow line of the receiving manhole.

## 2.7 TEES

- A. Gravity sewer tees shall be four or six inches and same diameter as the run of pipe. They shall be of same material as the sewer main.

## 2.8 LATERALS

- A. Shall be Polyvinyl Chloride pipe with bells and rubber gaskets for jointing, conforming, to Paragraph 2.1-A, PVC Pipe.

## 2.9 STONE BACKFILL

- A. Shall be graded crushed granite with the following gradation:

Square Opening Size	Percent Passing
1 inch	100%
3/4 inch	90 to 100%
3/8 inch	0 to 65%
No. 4	0 to 25%

## 2.10 SAND BACKFILL

- A. Shall be clean sand free from clay and organic material. Not more than 10% shall pass the No. 100 sieve.

## 2.11 BORROW

- A. Where it is determined sufficient suitable material is not available from the site to satisfactorily backfill pipe to at least two feet above top of pipe, Contractor shall furnish suitable sandy borrow material to accomplish requirements. Material shall not have more than 60% passing the No. 100 sieve, nor more than 20% passing a No. 200 sieve.

## 2.12 AIR RELEASE VALVE

OMITTED

## 2.13 METAL DETECTOR TAPE

- A. Will be installed above all pipe. Tape shall consist of 0.35 mils thick solid foil core encased in a protective plastic jacket resistant to alkalis, acids, and other destructive elements found in the soil. The lamination bond shall be strong enough so layers cannot be separated by hand. Total composite thickness shall be 5.0 mils. Foil core to be visible from unprinted side to ensure continuity. The tape shall have a minimum 3-inch width and a tensile strength of 35 lbs. per inch.

A continuous warning message indicating "sewer line" repeated every 16 inches to 36 inches shall be imprinted on the tape surface. Tape shall contain an opaque color concentrate designating color code appropriate to the line being buried (Sewer Line – Green).

#### **2.14 TRACING WIRE**

- A. Will be used over all force main, sanitary sewer and service lateral lines. The wire will be #12 gauge insulated single strand copper wire.

#### **2.15 SUBMERSIBLE SEWAGE PUMPING STATION**

OMITTED

#### **2.16 CHECK VALVES**

OMITTED

#### **2.17 GATE VALVES**

OMITTED

#### **2.18 PLUG VALVES**

OMITTED

#### **2.19 PRODUCT REVIEW**

- A. Contractor shall provide the Engineer with a complete description of all products before ordering. Engineer will review all products before they are ordered by Contractor.

### **PART 3 – EXECUTION**

#### **3.1 CONSTRUCTION OBSERVATION**

- A. The line, grade, deflection, and infiltration of sewers shall be tested by Contractor under the direction of Engineer. Engineer or Project Representative will have the right to require any portion of work be completed in their presence. If work is covered up after such instruction, it shall be exposed by Contractor for observation. However, if Contractor notifies Engineer such work is scheduled and Engineer fails to appear within 48 hours, the Contractor may proceed. All work completed and materials furnished shall be subject to review by the Engineer or Project Representative. All improper work shall be reconstructed. All materials not conforming to requirements of specifications shall be removed from the work upon notice being received from Engineer for rejection of such materials. Engineer shall have the right to mark rejected materials to distinguish them as such.
- B. Contractor shall give the Project Engineer or Project Representative a minimum of 48-hours' notice for all required observations or tests.

It will also be required by Contractor to keep accurate, legible records of the location of all sanitary lines, service laterals, manholes, force mains, valves, bends, and appurtenances. These records will be prepared in accordance with "Record Data and Drawings" paragraph in the Special Conditions. Final payment to the Contractor will be withheld until all such information is received and accepted.

### 3.2 LOCATION AND GRADE

- A. Line and grade of sewers and position of all manholes and other structures are shown on the drawings. Grade line as given on the profile or mentioned in these specifications means invert or inside bottom of pipe. Price for trenching shall include trench for depth below this line necessary to lay sewer to grade, but measurements for payment will be made only to grade line. Master control lines and benchmarks have been provided by the Engineer. The Contractor shall be responsible for proper locations and grades of sewers.

### 3.3 SEWER EXCAVATION

- A. Contractor shall perform all excavations of every description and of whatever substance encountered to the depth shown on the plans or specified for all sewers, manholes, and other appurtenances. All excavations shall be properly dewatered before installations are made, by the use of well points, pumping, or other methods accepted by Engineer. Trenches shall be excavated in conformance with the Occupational and Safety Health Administration's (OSHA) Regulations.
- B. Where the character of soil is unsuitable for pipe bedding as determined by Engineer or Geotechnical Consultant, additional excavation will be authorized. Engineer or Geotechnical Consultant shall determine the depth needed for additional bedding and whether material will be sand or stone. The unsuitable material shall be disposed of at Contractor's expense in a proper manner. Bottom of all trenches shall be rounded to conform to the bottom of pipe, to afford full bearing on pipe barrel. Excavation in excess of depths and widths required for sewers, manholes, and other structures shall be corrected by pouring subfoundations of 3,000 p.s.i. concrete and half cradle at the Contractor's expense.
- C. Trenches shall not be excavated more than 400 feet in advance of pipe laying.

### 3.4 TRENCH WALL SUPPORT

- A. Bracing and Sheeting – The sides of all trenches shall be securely held by stay bracing, or by skeleton or solid sheeting and bracing, as required by soil conditions encountered, to protect adjoining property and for safety. Where shown on drawings or where directed by Engineer, the Contractor must install solid sheeting to protect adjacent property and utilities. Sheeting shall be steel, or timber and Contractor shall submit design data, including the section modulus of members and arrangement for bracing at various depths, to Engineer for review before installing sheeting. It shall penetrate at least 3-feet below the pipe invert. Contractor shall ensure support of pipe and its embedment is maintained throughout installation and ensure sheeting is sufficiently tight to prevent washing out of the trench wall from behind sheeting.

- B. Sheeting Removal – Sheeting shall be removed in units and only when backfilling elevation has reached the level necessary to protect pipe, adjoining property, personnel, and utilities. Removal of sheeting or shoring shall be accomplished in a manner to preclude loss of foundation support and embedment materials. Fill voids left on removal of sheeting or shoring and compact all materials to required densities.
- C. Movable Trench Wall Supports – Do not disturb installed pipe and its embedment when using movable trench boxes and shields. Movable supports should not be used below top of pipe zone unless acceptable methods are used for maintaining the integrity of embedment material. Before moving supports, place and compact embedment to sufficient depths to ensure protection of the pipe. As supports are moved, finish placing and compacting embedment.
- D. When sheeting or shoring cannot be safely removed, it shall be left in place. Sheeting left in place shall be cut off at least 2 feet below the surface. No separate payment shall be made for bracing and sheeting except where shown on drawings or authorized by the Engineer.

### 3.5 LAYING PIPE

- A. All sewer pipe shall be laid upgrade with spigots pointing downgrade and in accordance with ASTM D 2321. The pipe shall be laid in a ditch prepared in accordance with Paragraph 3.3 "Sewer Excavation." When sewer is complete, the interior surface shall conform on bottom accurately to grades and alignment fixed or given by Engineer. Special care shall be taken to provide a firm bedding in good material, select borrow, stone backfill or 3,000 p.s.i. concrete, as authorized, for length of each joint and 1/2 of the circumference. Holes shall be provided to relieve bells from bedding strain, but not so large to allow separation of the bell from barrel by settlement after backfilling. All pipe shall be cleaned out and left clean. Every third joint shall be filled around immediately after being properly placed.
- B. Jointing – Comply with manufacturer's recommendations for assembly of joint components, lubrication, and making joints. When pipe laying is interrupted, secure piping against movement and seal open ends to prevent the entrance of water, mud, or foreign material.
- C. Placing and Compacting Pipe Embedment – Place embedment materials by methods which will not disturb or damage the pipe. Work in and tamp haunching material in area between the bedding and underside of pipe before placing and compacting remainder of embedment in pipe zone. Do not permit compaction equipment to contact and damage the pipe. Use compaction equipment and techniques compatible with materials used and location in the trench. Before using heavy compaction or construction equipment directly over the pipe, place sufficient backfill to prevent damage, excessive deflections, or other disturbance of the pipe.
- D. Rock or Unyielding Materials in Trench Bottom – If ledge rock, hard pan, shale, or other unyielding material, cobbles, rubble, debris, boulders, or stones larger than

1.5-inches are encountered in the trench bottom, excavate a minimum depth of 6-inches below pipe bottom and replace with proper embedment material.

- E. Vertical Risers – Provide support for vertical risers as commonly found at service connections, cleanouts, and drop manholes to preclude vertical or lateral movement. Prevent the direct transfer of thrust due to surface loads and settlement and ensure adequate support at points of connection to main lines.
- F. Exposing Pipe for Making Service Line Connections – When excavating for a service line connection, excavate material from above the top of main line before removing material from sides of pipe. Materials and density of service line embedment shall conform to specifications for the main line.
- G. Manhole Connections – Use flexible water stops, resilient connectors, or other flexible systems acceptable to the Engineer making watertight connections to manholes and other structures.

### 3.6 SEPARATION BETWEEN WATER & SANITARY SEWER

#### A. Parallel Installation:

1. Water mains shall be laid at least 10-feet horizontally from any existing or proposed sanitary sewer, storm sewer, or sewer manhole. The distance shall be measured edge-to-edge.
2. When conditions prevent a horizontal separation of 10 feet, water main may be laid closer to a sewer (on a case-by-case basis) provided the water main is laid in a separate trench or on an undisturbed earth shelf located on one side of the sewer at such an elevation where bottom of water main is at least 18 inches above top of sewer. It is advised the sewer to be constructed of materials and with joints equivalent to water main standards of construction and be pressure tested to assure water-tightness prior to backfilling.

#### B. Crossing:

1. Water mains crossing house sewers, storm sewers, or sanitary sewers shall be laid to provide a separation of at least 18 inches between the bottom of water main and top of sewer. At crossings, one full length of water pipe shall be located so both joints will be as far from the sewer as possible. Special structural support for the water and sewer pipes may be required.
2. When conditions prevent a vertical separation of 18-inches, the sewer passing over or under water mains shall be constructed of materials and with joints equivalent to water main standards of construction and shall be pressure tested to assure water-tightness prior to backfilling.
3. When water mains cross under sewers, additional measures shall be taken by providing:
  - a. a vertical separation of at least 18-inches between bottom of the sewer and top of water main;

- b. adequate structural support for sewers to prevent excessive deflection of joints settling on and breaking the water mains;
- c. length of water pipe be centered at the point of crossing so joints will be equidistant and as far as possible from sewer; and
- d. both sewer and water main shall be constructed of water pipe and subjected to hydrostatic tests, as prescribed in this document. Encasement of the water pipe in concrete shall also be considered.
- e. crossings shall conform to South Carolina Department of Health and Environmental Control's Bureau of Water Standards for Wastewater Facility Construction: Regulation 61-67.

### 3.7 BACKFILLING

- A. All trenches and excavation shall be backfilled immediately after pipes are laid therein, unless other protection of the pipeline is directed. Backfilling material shall be selected and deposited with special reference to the future safety of pipes. Except where special methods of bedding and tamping are provided for, clean earth or sand shall be solidly tamped about pipe up to a level at least 2 feet above top of pipes, and shall be carefully deposited to uniform layers, each layer solidly tamped or rammed with proper tools to not injure or disturb the pipeline. Remainder of the trench backfilling shall be carried on simultaneously on both sides of pipe in such a manner preventing injurious side pressure. The material used shall be selected from excavations anywhere on site if any of this soil is suitable. Backfill material shall be clean and free of rock, organic and other deleterious matter.

Under traffic areas, the top 24 inches of backfill material shall be compacted to a density of not less than 98% of maximum laboratory density (ASTM D698) at optimum moisture. Below the 24-inch line and to and including area around pipe, density shall not be less than 95% of maximum laboratory density at optimum moisture. In non-traffic areas, the backfill material shall be compacted to a density of not less than 98% of maximum laboratory density at optimum moisture unless otherwise accepted by Engineer. Compaction tests shall be conducted in accordance with ASTM D 6938 by an independent testing laboratory. Tests are to be taken at the direction of Engineer.

Whenever trenches have not been properly backfilled, or if settlement occurs, they shall be refilled, smoothed off and finally made to conform to the ground surface. Backfilling shall be carefully performed, and original surface restored to the full satisfaction of Engineer immediately after installation.

Where thermoplastic (PVC) pipe is installed, Contractor shall take precautions in accordance with ASTM D 2321, during backfilling operations so not to create excessive side pressures, or vertical or horizontal deflection of the pipe nor impair flow capacity.

### 3.8 MANHOLES

- A. Manholes shall be constructed where shown on the drawings or where directed by Engineer. The channel in bottom of manholes shall be smooth and properly rounded. Special care must be exercised in laying the channel and adjacent pipes to grade. Manhole top elevations shall be greater than or equal to the 50-year flood elevation, unless watertight covers are provided. Tops of manholes outside of roads shall be built to grades 1-inch above ground surface in developed areas and 6 inches above ground surface in undeveloped areas unless otherwise shown on the plans. Manholes in roads shall be built to grades designated by the Engineer. Manhole sections with either honeycomb defects; exposed reinforcing; broken/fractured tongue or groove; or cracked walls will be subject to rejection by Engineer for use on the project. When mastic sealant is used, improperly applied primer will also be cause for rejection.
- B. No leaks in any manhole will be acceptable. All repairs made from inside the manhole shall be made with mortar composed of one-part Portland cement and two parts clean sand. The mixing liquid shall be straight bonding agent equivalent to "Acryl 60."
- C. Sewer Manholes. No potable water pipe shall pass through or come into contact with any part of a sewer manhole.
- D. Drop manholes are required where the invert differential is 24-inches or more.
- E. Manholes shall have a minimum inside diameter of 4-feet and 5-feet with an inside drop pipe. The minimum manhole access diameter shall be 22-inches.
- F. Force mains tying onto manholes shall enter the manhole a vertical distance of not more than 2-feet above the flow line of the receiving manhole.

### 3.9 STONE BEDDING

- A. Where, in the Engineer's or Geotechnical Consultant's opinion, subgrade of pipe trench is unsuitable material, Contractor shall remove unsuitable material to a depth determined by Engineer or Geotechnical Consultant and furnish and place stone backfill in trench to stabilize subgrade. Presence of water does not necessarily mean stone backfill is required. If well points or other types of dewatering will remove the water, Contractor shall be required to completely dewater trench in lieu of stone backfill. Stone bedding will be limited to areas where well pointing and other conventional methods of dewatering will not produce a dry bottom. Stone shall be placed 4 feet wider than the outside diameter of pipe. The pipe shall be carefully bedded in stone as specified, or in accordance with manufacturer's recommendations.

### 3.10 SAND BEDDING

- A. Where, in the Engineer's or Geotechnical Consultant's opinion, character of soil is unsuitable for pipe bedding, even though dewatered, additional depth of excavation as determined by Engineer or Geotechnical Consultant shall be made and replaced with clean sand furnished by Contractor.

### 3.11 DEFLECTION

- A. It is the Contractor's responsibility to assure backfill is sufficient to limit pipe deflection to no more than 5%. When flexible pipe is used, a deflection test shall be made by Contractor on the entire length of installed pipeline, not less than 30-days after completion of all backfill and placement of any fill. Deflection shall be determined by use of a deflection device or by use of a spherical, spheroidal, or elliptical ball, a cylinder, or circular sections fused to a common shaft. Ball, cylinder, or circular sections shall have a diameter, or minor diameter as applicable, of 95% the inside pipe diameter. The ball, cylinder, or circular sections shall be of a homogeneous material throughout, shall have a density greater than 1.0 as related to water at 39.2 degrees F, and shall have a surface brinell hardness of not less than 150. The device shall be center bored and through bolted with a 1/4-inch minimum diameter steel shaft having a yield strength of 70,000 p.s.i. or more, with eyes at each end for attaching pulling cables. The eye shall be suitably backed with flange or heavy washer; a pull exerted on opposite end of shaft shall produce compression throughout remote end of ball, cylinder, or circular section. Circular sections shall be spaced so distance from the external faces of front and back sections shall equal or exceed diameter of circular section. Failure of the ball, cylinder, or circular section to pass freely through a pipe run, either by being pulled through by hand or by being flushed through with water, shall be cause for rejection of individual run. When a deflection device is used for the test in lieu of a ball, cylinder, or circular sections described, such device shall be acceptable to Engineer prior to use. Device shall be sensitive to 1.0% of diameter of pipe being measured and shall be accurate to 1.0% of indicated dimension. Installed pipe showing deflections greater than 5% of the normal diameter of pipe shall be retested by a run from opposite direction. If retest also fails, the suspect pipe shall be repaired or replaced at no cost to Owner.

### 3.12 LEAKAGE

- A. Leakage or vacuum testing of all manholes is required.
- B. In no stretch of sewer between any two adjoining manholes shall infiltration/exfiltration exceed 25 gallons/day/inch of pipe diameter per mile of pipe. In case leakage exceeds this amount, the sewer shall not be accepted until such repairs and replacements are made to comply with above requirements. Such corrections will be made at the Contractor's expense. All visible leaks shall be repaired, regardless of the amount of leakage.
- B. Lines shall be tested for leakage by low pressure air testing, infiltration tests, or exfiltration tests, as appropriate. Low pressure air testing for PVC pipe shall be as prescribed in ASTM F 1417. Prior to infiltration or exfiltration tests, trench shall be backfilled up to at least the lower half of pipe. If required, sufficient additional backfill shall be placed to prevent pipe movement during testing, leaving the joints uncovered to permit inspection. Visible leaks encountered shall be corrected regardless of leakage test results. When water table is 2 feet or more above top of pipe at the upper end of pipeline section to be tested, infiltration shall be measured using a suitable weir or other device acceptable to Engineer. When Engineer determines infiltration cannot be properly tested, an exfiltration test shall be made by filling the line to be tested with water so a head of at least 2

feet is provided above both water table and top of pipe at upper end of pipeline to be tested. The filled line shall be allowed to stand until pipe has reached its maximum absorption, but not less than 4 hours. After absorption, the head shall be re-established. The amount of water required to maintain this water level during a 2-hour test period shall be measured. Leakage as measured by either the infiltration test or exfiltration test shall not exceed 25 gallons per inch diameter per mile of pipeline per day. When leakage exceeds the maximum amount specified, satisfactory correction shall be made and retesting accomplished. Testing, correction, and retesting shall be made at no additional cost to the Owner.

### **3.13 CLEANING AND ACCEPTANCE**

- A. Before acceptance of sewer system, it shall be tested and cleaned to the satisfaction of Engineer. Where any obstruction is met, Contractor will be required to clean sewers by means of rod and swabs or other instruments. The pipeline shall be straight and show a uniform grade between manholes. The Engineer shall check lines by lamping or other methods to determine final acceptance.

### **3.14 CLOSING PIPE**

- A. When work or pipe installation is suspended, either for the night or at other times, end of sewer must be closed with a tight cover. Contractor will be held responsible for keeping the sewer free from obstruction.

### **3.15 PARTIAL ACCEPTANCE OF THE WORK**

- A. Owner reserves right to accept and use any part of the work. Engineer shall have power to direct on what line the Contractor shall work and order thereof.

### **3.16 GRASSING**

- A. Grassing of areas disturbed during construction shall be in accordance with Section 02902 – "Grassing."

### **3.17 RECORD DATA**

- A. It will be required of the Contractor to keep accurate, legible records, locating all sewers, force mains, tees, and laterals. These records will be made available to Engineer before final review for incorporation into the Engineer's Record Drawings. Final payment to the Contractor will be withheld until all such information is received and accepted.

### **3.18 REMOVE AND REPLACE PAVEMENT**

OMITTED

**3.19 METALLIC DETECTOR TAPE**

- A. Contractor shall place metallic detector tape, suitably coded, directly over all installed pipes at a depth of 18-inches below the finished surface.

**3.20 TRACING WIRE**

- A. Tracing wire will be installed on all force mains, sanitary sewer and service laterals directly on top of the pipe. Wire shall be secured to the pipe with tape or other acceptable methods at spacings of no more than 36-inches apart. Where sections of wire are jointed together, the wire insulation shall be stripped so bare wires can be wrapped with a rubberized insulation tape. The insulated wire must maintain electrical continuity. This tracing wire system shall be checked and tested by the Contractor, in presence of Engineer or Owner prior to acceptance of force main sanitary sewer and service laterals. All equipment, meters, detectors, etc., needed for testing shall be furnished by the Contractor.

**3.21 CONNECT SEWERS TO EXISTING STRUCTURES**

- A. Contractor shall connect the system to existing structures where indicated. For brick structures, a hole not more than 4 inches larger than the outside diameter of new pipe shall be cut neatly in structure, new pipe laid so it is flush with inside face of structure, and annular space around pipe filled with a damp, expanding mortar or grout to make a watertight seal. For precast structures, core proper size hole in structure for pipe being connected, attach flexible sleeve into cored hole and connect new pipe into flexible sleeve with a stainless-steel band.

**3.22 FIELD QUALITY CONTROL**

A. Soil and density tests shall be made by a testing laboratory acceptable to the Engineer. Laboratory tests of the soil shall be made in accordance with ASTM D 698. In-place density tests shall be made in accordance with ASTM D 6938. Results of the tests shall be furnished to the Engineer.



The minimum number of tests required shall be:

Backfill over sewer in traffic areas.....	1 per 100 linear feet or less for each 4 feet of depth or portion thereof.
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Backfill over sewer in non-traffic areas...	1 per 500 linear feet or less for each 6 feet of depth or portion thereof.
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**3.23 AIR RELEASE VALVE**

OMITTED

**3.24 SEWAGE PUMPING STATION**

OMITTED

**3.25 FORCE MAIN**

OMITTED

**3.26 BYPASSING**

OMITTED

**END OF SECTION**

**REFERENCE ONLY**

**INDEX TO**  
**SECTION 02890 – TRAFFIC SIGNS**

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**REFERENCE ONLY**

## SECTION 02890 – TRAFFIC SIGNS

### PART 1 – GENERAL

#### 1.1 WORK INCLUDED

- A. Signs.
- B. Posts.
- C. Fabricating and installing traffic signs in accordance with details shown on construction plans and the Manual on Uniform Traffic Control Devices.

#### 1.2 REFERENCES (LATEST REVISION)

- A. ASTM A 123 – Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
- B. ASTM A 153 – Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
- C. ASTM A 193 – Alloy-Steel and Stainless-Steel Bolting for High Temperature or High-Pressure Service and Other Special Purpose Applications.
- D. ASTM A 307 – Carbon Steel Bolts and Studs, 60,000-PSI Tensile Strength.
- E. ASTM A 615 – Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement.
- F. ASTM B 209 – Aluminum and Aluminum-Alloy Sheet and Plate.
- G. ASTM B 211 – Aluminum and Aluminum-Alloy Bar, Rod, and Wire.

#### 1.3 SUBMITTALS

- A. A sample of all signs and posts to be placed shall be submitted to the Engineer for review prior to ordering.

#### 1.4 QUALITY ASSURANCE

- A. Material and equipment shall be the standard product of a manufacturer who has manufactured them for a minimum of 2-years and provides published data on quality and performance.

#### 1.5 GUARANTEE

- A. Contractor shall guarantee the quality of materials and workmanship for a period of 12-months after acceptance. Defects discovered during this period shall be repaired by Contractor at no cost to the Owner.

#### 1.6 MEASUREMENT AND PAYMENT

- A. Payment for signs will include all necessary labor and materials to fabricate and install the sign. Payment will be made on a job lump sum basis, as indicated on the bid form.

## **PART 2 – PRODUCTS**

### **2.1 UNIFORMITY**

- A. All signs shall be uniform in shape, color, dimensions, legends, and illumination or reflectorization.

### **2.2 MATERIALS AND WORKMANSHIP**

- A. Signs: Shall be aluminum 0.08-inch minimum thickness and shall conform to ASTM B 209, Alloy 6061-T6 or 5053-H38. Finished sign shall be clear cut, the lines of all letters and details true, regular and free from waviness, unevenness, furry edges, or lines and shall be free from all scaling, cracking, blistering, pitting, dents, or blemishes of any kind.
- B. Sign Posts: Shall be galvanized steel flanged "U" channel section with a minimum (before punching or drilling) of two (2) pounds per foot and shall conform to the minimum yield point and tensile strength specified in ASTM A 615 Grade 60. Galvanizing shall be in accordance with ASTM A 123. Length as specified on the plans. Holes may be punched or drilled 3/8 inch in diameter and spaced one (1) inch center to center beginning one (1) inch from the top and extending the full length of post.
- C. Hardware: Bolts shall be 5/16-inch diameter with hexagonal heads and of sufficient length to extend at least 1/4 inch beyond the nut when installed. Nuts shall be hex nuts of the self-locking plastic insert type. The thread fit for nuts shall be ANSI, Class 2B. The washers shall be flat and 25/64-inch ID by 3/4 inch OD by 0.091 inch thick. These washers are to be placed between head of bolt and sign face. Bolts, nuts, washers and spacers may be aluminum, stainless steel or galvanized steel. Galvanized steel bolts and washers shall conform to ASTM A 307, galvanized in accordance with ASTM A 153. Aluminum shall conform to ASTM B 211, Alloy 2024-T4 for bolts, Alloy 2017-T4 for nuts, and ASTM B 209, Alloy 2024-T4 for washers. Stainless steel shall conform to ASTM A 193, Type B8.

### **2.3 PRODUCT REVIEW**

- A. Contractor shall provide the Engineer with a complete description of all products before ordering. The Engineer will review all products before they are ordered.

## **PART 3 – EXECUTION**

### **3.1 GENERAL**

- A. Sign posts and their foundations and sign mountings shall be constructed to hold signs in a proper and permanent position, to resist swaying in the wind or displacement by vandalism.

### **3.2 LOCATION**

- A. Signs are to be placed as shown on the plans. Signs shall conform to height and lateral locations as shown in the Manual on Uniform Traffic Control Devices.

### 3.3 ERECTION

- A. Drive type posts may either be driven in place or placed in prepared holes. Driven posts will be limited to locations where the surrounding soil is firm and stable. When sandy or unstable soils are present, each drive post shall be placed in a prepared dry hole minimum six (6) inches in diameter. Whenever posts are placed in prepared holes, the holes shall be backfilled with a mixture of Portland Cement and sand. The resultant mixture shall be mixed with water to a moist consistency and placed around posts. All posts shall be erected in a vertical and plumb position to a depth of three (3) feet and at an angle to the roadway as shown on plans or directed by Engineer.

**END OF SECTION**

**REFERENCE ONLY**

**INDEX TO**  
**SECTION 02902 - GRASSING**

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REFERENCE ONLY

## SECTION 02902

### GRASSING

#### PART 1 – GENERAL

##### 1.1 SECTION INCLUDES

- A. Seeding, planting grass, and fertilizing graded areas behind the structures, pipeline rights-of-way, roadway shoulders and other disturbed areas.
- B. Seed protection.
- C. Maintaining seeded areas until final acceptance.

##### 1.2 RELATED WORK

- A. Civil plans and specifications.

##### 1.3 DELIVERY, STORAGE, AND HANDLING

- A. Deliver grass seed in original containers showing analysis of seed mixture, percentage of pure seed, year of production, net weight, date of packaging, and location of packaging. Damaged packages are not acceptable. Store in cool, dry locations away from contaminants.
- B. Deliver fertilizer in waterproof bags showing weight, chemical analysis, and name of manufacturer. Damaged bags are not acceptable. Store in cool, dry locations away from contaminants.
- C. Deliver sod on pallets.
- D. All material shall be acceptable to Engineer prior to use.

##### 1.4 PLANTING DATES

- A. This specification provides for establishment of a permanent grass cover between the dates of March 1 and September 30. If finished earth grades are not completed in time to permit planting and establishment of permanent grass during the favorable season between dates specified above unless otherwise accepted, Contractor will be required to plant a temporary cover to protect new graded areas from erosion and to keep windborne dust to a minimum. The temporary cover shall be planted between October 1 and February 28 unless otherwise permitted.

REFERENCE ONLY

## 1.5 MEASUREMENT AND PAYMENT

- A. When the season or stage of project is such results of grassing work cannot be determined, conditional acceptance will be made on work completed. When conditional acceptance is made for items of work covered, Contractor shall be entitled to 50% of bid price for the actual work placed and shall receive remaining 50% of bid price when final acceptance is made. Conditional acceptance shall not apply to the remaining items of work, and full bid price payment shall be made when work is acceptably placed and completed in accordance with specifications.
- B. Payment for grassing will be made at contract unit price for the item "Grassing" and such payment shall constitute full compensation for furnishing and placing temporary and permanent seed and fertilizer or sod, where directed, and protecting and maintaining seed and sod in all graded and disturbed areas.

## PART 2 – PRODUCTS

- A. Contractor shall submit source and species certification documents to Engineer and Owner's Representative for review prior to installation. Supply complete information on all analysis/test methodologies and results; laboratory certifications, manufacturer's specifications, and agency approvals to the Landscape Architect/Project Engineer prior to placement of soil mixtures. In addition, provide the Landscape Architect/Project Engineer with thoroughly mixed sample of soil mixes for acceptance prior to placement. Landscape Contractor shall make modifications and improvements to soil mixes deemed necessary by the soil analysis to meet requirements specified here in before, and to ensure proper growing medium for plant material.

### 2.1 SEED

- A. All seed shall conform to State Laws and requirements and regulations of the State Department of Agriculture.
- B. The varieties of seed, as specified in Section 2.2, shall be individually packaged or bagged, and tagged to show name of seed, net weight, origin, germination, lot number, and other information required by the State Department of Agriculture.
- C. Engineer reserves the right to test, reject, or accept all seed before seeding.

REFERENCE ONLY

## 2.2 SEEDING SCHEDULE

TEMPORARY SEEDING - COASTAL													
SPECIES	LABS/AC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
<b>SANDY, DROUGHTY SITES</b>													
BROWNTOP MILLET	40												
RYE, GRAIN	56												
RYEGRASS	50												
<b>WELL DRAINED, CLAYEY/LOAMEY SITES</b>													
BROWNTOP MILLET	40												
JAPANESE MILLET	40												
RYE, GRAIN	56												
OATS	75												
RYEGRASS	50												

PERMANENT SEEDING - COASTAL													
SPECIES	LABS/AC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
<b>SANDY, DROUGHTY SITES</b>													
BROWNTOP MILLET	10												
BAHIAGRASS	40												
BROWNTOP MILLET	10												
BAHIAGRASS	30												
SERICA LESPEDEZA	40												
BROWNTOP MILLET	10												
ATLANTIC COASTAL PANICGRASS	15 PLS												
BROWNTOP MILLET	10												
SWITCHGRASS (ALAMO)	8 PLS												
LITTLE BLUESTEM	4												
SERICA LESPEDEZA	20												
BROWNTOP MILLET	10												
WEeping LOVEGRASS	8												
<b>WELL DRAINED, CLAYEY/LOAMEY SITES</b>													
BROWNTOP MILLET	10												
BAHIAGRASS	40												
RYE, GRAIN	10												
BAHIAGRASS	40												
CLOVER, CRIMSON (ANNUAL)	5												
BROWNTOP MILLET	10												
BAHIAGRASS	30												
SERICA LESPEDEZA	40												
BROWNTOP MILLET	10												
BERMUDA, COMMON	10												
SERICA LESPEDEZA	40												
BROWNTOP MILLET	10												
BERMUDA, COMMON	12												
KOBE LESPEDEZA (ANNUAL)	10												
BROWNTOP MILLET	10												
BAHIAGRASS	20												
BERMUDA, COMMON	6												
SERICA LESPEDEZA	40												
BROWNTOP MILLET	10												
SWITCHGRASS	8												
LITTLE BLUESTEM	PLS												
INDIANGRASS	3												

NOTE:  
GRASSING SHALL BE COMPLETED PER SCDOT SPECIFICATIONS.

## 2.3 FERTILIZER

- A. Commercial fertilizer of accepted type, conforming to State fertilizer laws at the rate as recommended by soils test.

## 2.4 LIME

- A. Agricultural grade, ground limestone at the rate as recommended by soils test.

**2.5 SPRIG**

OMITTED

**2.6 SPRIGGING SCHEDULE**

OMITTED

**2.7 SOD**

OMITTED

**2.8 ACCESSORIES**

- A. Straw Mulch: Oat or wheat straw, reasonably free from weeds, foreign matter detrimental to plant life, and in dry condition.
- B. Excelsior Mulch: Excelsior mulch shall consist of wood fibers cut from sound, green timber. The average length of fibers shall be 4 to 6 inches. Cut shall be made in such a manner as to provide maximum strength of fiber, but at a slight angle to natural grain of the wood to cause splintering of fibers when weathering in order to provide adherence to each other and to soil.
- C. Wood cellulose fiber shall be made from wood chip particles manufactured particularly for discharging uniformly on the ground surface when dispersed by a hydraulic water sprayer. It shall remain in uniform suspension in water under agitation and blend with grass seed and fertilizer to form a homogenous slurry. Mulch fibers shall intertwine physically to form a strong moisture holding mat on the ground surface and allow rainfall to percolate into underlying soil. The mulch shall be heat processed to contain no germination or growth-inhibiting factors. It shall be dyed (non-toxic) an appropriate color to facilitate metering of material.

**2.9 PRODUCT REVIEW**

- A. Contractor shall provide the Engineer with a complete description of all products before ordering. The Engineer will review all products before they are ordered.

**PART 3 – EXECUTION****3.1 PREPARATION**

- A. Areas to be seeded shall be made smooth and uniform and shall conform to the finished grade indicated on plans.
- B. Remove foreign materials, plants, roots, stones, and debris from surfaces to be seeded.
- C. Grassing areas, if not loose, shall be loosened to a minimum depth of 3 inches before fertilizer, seed or sod is applied.
- D. Amendments to soils shall be incorporated into loosened 3-inch top soil layer as recommended by soils tests.

- E. Contractor shall provide Topsoil Analysis Tests performed by a State Agricultural Experiment Station, Soil and Water Conservation District, State University, or other qualified private testing laboratory, as acceptable to Landscape Architect/Project Engineer. Soils test shall identify existing pH and nutrient levels, as well as recommended adjustments based on the type of grass to be installed.

### **3.2 STAND OF GRASS**

- A. Before acceptance of seeding, sodding, or sprigging is performed for the establishment of permanent vegetation, Contractor will be required to produce a satisfactory stand of perennial grass whose root system shall be developed sufficiently to survive dry periods and winter weather and be capable of re-establishment in spring.
- B. Before acceptance of seeding is performed for the establishment of temporary vegetation, Contractor will be required to produce a stand of grass sufficient to control erosion for a given area and length of time before the next phase of construction or establishment of permanent vegetation is to commence.

### **3.3 SEEDING DATES**

- A. Seeding shall be performed during periods and at rates specified in their respective schedules. Seeding work may, at discretion of Contractor, be performed throughout the year using schedule prescribed for given period. Seeding work shall not be conducted when the ground is frozen or excessively wet. Contractor will be required to produce a satisfactory stand of grass regardless of the period of year work is performed.

### **3.4 APPLYING LIME AND FERTILIZER**

- A. Following advance preparation and placing selected material for shoulders and slopes, lime and fertilizer, if called for based on soil tests, shall be spread uniformly over the designated areas, and shall be thoroughly mixed with the soil to a depth of approximately 2 inches. Fertilizer and lime shall be applied at the rate recommended by required soils test. Unless otherwise provided, lime will not be applied for temporary seeding. In all cases where practicable, acceptable mechanical spreaders shall be used for spreading fertilizer. On steep slopes subject to slides and inaccessible to power equipment, the slopes shall be adequately scarified. Fertilizer may be applied on steep slopes by hydraulic methods as a mixture of fertilizer and seed. When fertilizer is applied with combination seed and fertilizer drills, no further incorporation will be necessary. The fertilizer and seed shall be applied together when Wood Cellulose Fiber Mulch is used. Any stones larger than 2-1/2 inches in any dimension, larger clods, roots, or other debris brought to the surface shall be removed.

### **3.5 SEEDING**

- A. Seed shall be sown within 24 hours following application of fertilizer and lime and preparation of the seedbed as specified in Section 3.4. Seed shall be uniformly sown at rate specified by the use of acceptable mechanical seed drills. Rotary hand seeders, power sprayers or other satisfactory equipment may be used on steep slopes or on other areas inaccessible to seed drills.

- B. Seeds shall be covered and lightly compacted by means of cultipacker or light roller if the drill does not perform this operation. On slopes inaccessible to compaction equipment, the seed shall be covered by dragging spiked chains, by light harrowing or by other satisfactory methods.
- C. Apply water with fine spray immediately after each area has been sown.
- D. Do not sow seed when ground is too dry, during windy periods or immediately following a rain.
- E. If permitted by the special provisions, wood cellulose fiber mulch or excelsior fiber mulch may be used.

### **3.6 SEED PROTECTION (STRAW MULCH)**

- A. All seeded areas seeded with permanent grasses shall be uniformly mulched in a continuous blanket immediately following seeding and compacting operations, using at least 2 tons of straw per acre.

### **3.7 SEED PROTECTION (EXCELSIOR MULCH)**

- A. Seed shall be sown as specified in Section 3.5. Within 24 hours after covering of seed, excelsior mulch shall be uniformly applied at the rate of 2 tons per acre. The mulch may be applied hydraulically or by other acceptable methods. Should the mulch be placed in a dry condition, it shall be thoroughly wetted immediately after placing. Engineer may require light rolling of the mulch to form a tight mat.

### **3.8 SEED PROTECTION (WOOD CELLULOSE FIBER MULCH)**

- A. After the lime has been applied and ground prepared as specified in Section 3.4, wood cellulose fiber mulch shall be applied at a rate of 1,500 pounds per acre in a mixture of seed and fertilizer. Hydraulic equipment shall be used for application of fertilizer, seed, and slurry of the prepared wood pulp. This equipment shall have a built-in agitation system with an operating capacity sufficient to agitate, suspend, and homogeneously mix a slurry of the specified amount of fiber, fertilizer, seed, and water. The slurry distribution lines shall be large enough to prevent stoppage. The discharge line shall be equipped with a set of hydraulic spray nozzles which will provide an even distribution of slurry on various areas to be seeded. The slurry tank shall have a minimum capacity of 1,000 gallons.

Seed, fertilizer, wood pulp mulch, and water shall all be combined into the slurry tank for distribution of all ingredients in one operation by hydraulic seeding method specified herein. Materials shall be combined in a manner recommended by the manufacturer. The slurry mixture shall be regulated so amounts and rates of application shall result in a uniform application of all materials at rates not less than amount specified. Using the color of wood pulp as a guide, equipment operator shall spray prepared seedbed with a uniform visible coat. The slurry shall be applied in a sweeping motion, in an arched stream to fall like rain, allowing wood fibers to build upon each other until an even coat is achieved.

### **3.9 SPRIGGING**

OMITTED

### 3.10 SODDING

OMITTED

## PART 4 – MAINTENANCE, WARRANTY AND ACCEPTANCE

### 4.1 MAINTENANCE

- A. Maintain grassed surfaces until final acceptance.
- B. Maintenance shall consist of providing protection against traffic, watering to ensure uniform seed germination and to keep surface of soil damp, and repairing any areas damaged as a result of construction operations or erosion. Maintenance shall also include, but is not limited to, watering, weeding, cultivating, removal of dead material, lawn mowing, fertilizing, and other necessary operations.
- C. The Contractor shall maintain all proposed plantings until the date of substantial completion issued by the Owner.

### 4.2 WARRANTY

- A. All grassed areas shall be guaranteed by Contractor to be alive and healthy for a one (1) year period from date of substantial completion issued by the Owner. A final walk through with the Owner shall be conducted at end of warranty period to determine if any areas require replanting. At end of warranty period, sod shall show evidence of rooting to underlying soil and shall have no competitive weed growth from either the sod or from between sod joints.
- B. Any grassed area which is dead or not showing satisfactory growth shall be replaced at Contractor's expense at the end of warranty period. All replacement shall be of original quality. Replacement required because of vandalism, excessive use, or other causes beyond the control of Contractor are not part of this contract.

### 4.3 ACCEPTANCE

- A. Before acceptance of seeding performed for the establishment of permanent vegetation, Contractor will be required to produce a satisfactory stand of perennial grass whose root system shall be developed sufficiently to survive dry periods and winter weather and be capable of reestablishment in spring.
- B. A minimum coverage of 80% density over 100% of the disturbed area is required for seeded areas before project acceptance.

**END OF SECTION**

**INDEX TO**  
**SECTION 03305 – SITE CONCRETE**

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REFERENCE ONLY

**SECTION 03305****SITE CONCRETE****PART 1 – GENERAL****1.1 SECTION INCLUDES**

- A. Concrete curbs and gutters.

**1.2 RELATED SECTIONS**

- A. Section 01400 – Quality Control.
- B. Section 01410 – Testing Services.
- C. Section 02204 – Earthwork: Preparation of site for paving [and base].
- D. Section 02231 – Aggregate Base Course.
- E. Section 02512SC – Asphaltic Concrete Binder/Surface Courses.

**1.3 MEASUREMENT AND PAYMENT**

- A. Curb and Gutter – Payment for concrete curb and gutter sections will be made at the contract lump sum.
- B. Payment shall constitute full compensation for furnishing all materials, plant, equipment, tools, forms, inserts, and for all labor and incidentals necessary to complete the work required by these specifications. No payment will be made for any material wasted, used for the convenience of the Contractor, unused or rejected.
- C. No separate measurement or payment will be made for miscellaneous concrete. This shall be paid for in other unit costs as applicable

**1.4 REFERENCES (LATEST REVISION)**

- A. ACI 117 – Specifications for Tolerances for Concrete Construction and Materials.
- B. ACI 301 – Specifications for Structural Concrete.
- C. ACI 304R – Guide for Measuring, Mixing, Transporting and Placing Concrete.
- D. ACI 318 – Building-Code Requirements for Structural Concrete and Commentary.
- E. ACI 330R – Guide for the Design and Construction of Concrete Parking Lots.
- F. ASTM A 185 – Steel Welded Wire Reinforcement, Plain, for Concrete.
- G. ASTM A 497 – Steel Welded Wire Reinforcement, Deformed, for Concrete.

- H. ASTM A 615 – Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement.
- I. ASTM C 31 – Making and Curing Concrete Test Specimens in the Field.
- J. ASTM C 33 – Concrete Aggregates.
- K. ASTM C 39 – Compressive Strength of Cylindrical Concrete Specimens.
- L. ASTM C 94 – Ready-Mixed Concrete.
- M. ASTM C 150 – Portland Cement.
- N. ASTM C 172 – Sampling Freshly Mixed Concrete.
- O. ASTM C 260 – Air-Entraining Admixtures for Concrete.
- P. ASTM C 309 – Liquid Membrane-Forming Compounds for Curing Concrete.
- Q. ASTM C 494 – Chemical Admixtures for Concrete.
- R. ASTM C 920 – Elastomeric Joint Sealants.
- S. ASTM E 1155 – Test Method for Determining FF Floor Flatness and FL Floor Levelness Numbers.
- T. ASTM C 1116 – Fiber-Reinforced Concrete.
- U. ASTM D 1751 – Preformed Expansion Joint Filler for Concrete Paving and Structural Construction. (Nonextruding and Resilient Bituminous Type).
- V. ASTM D 3740 – Minimum Requirements for Agencies Engaged in Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction.
- W. ASTM E 329 – Agencies Engaged in Construction Inspection and/or Testing.

REFERENCE ONLY

## **1.5 PERFORMANCE REQUIREMENTS**

OMITTED

## **1.6 SUBMITTALS FOR REVIEW**

- A. Section 01300 – Submittals: Procedures for submittals.
- B. Product Data: Provide data on joint filler, admixtures, and curing compounds.
- C. Concrete Design Mix.

## **1.7 QUALITY ASSURANCE**

- A. Perform work in accordance with ACI 301, ACI 318, and ACI 330R.

- B. Obtain cementitious materials from same source throughout.
- C. Conform to ACI 117 – Specifications for Tolerances for Concrete Construction and Materials.
- D. Method of measurement for accessible route with a 24" digital smart-level will be used to measure points along the accessible route. Line of measurement shall be parallel to the long edge of ramp or accessible route, whether straight or curved. Longitudinal measurement lines shall be spaced 3-feet apart, but in no case shall fewer than two lines be used. The horizontal measurement [cross-slope] will be measured every 6-feet. Engineer reserves the right to gather additional measurements if further investigation is necessary. The 24" Smart-level slope readings greater than specified tolerance within contract documents will be identified as non-compliant and not accepted.
- E. Engineer reserves the right to mark and reject portions of concrete not within tolerance as specified.

## 1.8 REGULATORY REQUIREMENTS

OMITTED

## 1.9 ENVIRONMENTAL REQUIREMENTS

- A. Do not place concrete when base surface temperature is less than 40 degrees F, or surface is wet or frozen.

## 1.10 GUARANTEE

- A. Contractor shall guarantee the quality of materials and workmanship for a period of 12-months after acceptance. Defects discovered during this period shall be repaired by the Contractor at no cost to the Owner.

## 1.11 TESTING

- A. Testing laboratory shall operate in accordance with ASTM D 3740 and E 329 and be acceptable to the Engineer.
- B. Testing laboratory and Project Engineer/Project Representative shall be given a minimum of 48 hours notice prior to taking any tests.
- C. Owner shall select and engage the testing laboratory. Testing laboratory shall be responsible to the Owner and Owner's Engineer. Payment for laboratory and all tests shall be by the Owner, except the Owner specifically reserves the right to deduct from the Contractor's payment, the expense and charges of the testing laboratory when:
  1. Contractor gives notice work is ready for inspection and testing, and fails to be ready for the test, and/or
  2. Testing of the Contractor's work, products, or materials fail, and retesting is required, and/or

3. Contractor abuses the services or interferes with the work of the testing laboratory in the conduct of this work.
- D. Test results shall be furnished to the Engineer prior to continuing with associated or subsequent work.

## **PART 2 – PRODUCTS**

### **2.1 FORM MATERIALS**

- A. Wood or steel form material profiled to suit conditions.
- B. Joint Filler: ASTM D1751 type; ½-inch thick.

### **2.2 REINFORCEMENT**

- A. As indicated on the construction plans.

### **2.3 CONCRETE MATERIALS**

- A. Cement: ASTM C 150, Type I – Normal.
- B. Fine and Coarse Mix Aggregates: ASTM C 33. Coarse aggregate shall consist of granite stone.
- C. Water: Potable, not detrimental to concrete.
- D. Air Entrainment: ASTM C 260.
- E. Chemical Admixture: ASTM C 494, Type A – Water Reducing.

### **2.4 ACCESSORIES**

- A. Curing Compound: ASTM C309, clear with fugitive dye.
- B. Sealant: Joints shall be sealed per detail on project drawings, conforming to ASTM C 920, Type S or M, Grade P or NS, Class 25.

### **2.5 CONCRETE MIX – BY PERFORMANCE CRITERIA**

- A. Provide concrete to the following criteria:
  1. Flexible Strength: 700-psi.
  2. Compressive Strength: 3,000-psi @ 28-days.
  3. Slump: 4 to 5-inches.
- B. Use accelerating admixtures in cold weather only when accepted by Engineer. Use of admixtures will not relax cold weather placement requirements.

- C. Use calcium chloride only when accepted by Engineer.
- D. Use set retarding admixtures during hot weather only when accepted by Engineer.

## 2.6 SOURCE QUALITY CONTROL AND TESTS

- A. All sampling and testing services shall be performed, at [Contractor's] [Owner's] expense, by a testing agency that operates in accordance to ASTM D 3740 and E 329 latest edition and accepted by the Engineer.
- B. Contractor shall submit to the Engineer a design mix on each class of concrete proposed for use. The mix shall be prepared by an accepted testing laboratory. Compressive strength of at least four specimens of the design mix shall indicate 15% higher than 28-days strengths specified. During the work, Contractor shall make three test cylinders for each 50-cubic-yards, or fraction thereof, of concrete placed each day. One cylinder shall be tested at 7-days and the other two at 28-days in accordance with ASTM C 39. Copies of all test reports shall be furnished to the Engineer.

## PART 3 – EXECUTION

### 3.1 EXAMINATION

- A. Verify subgrade conditions under provisions of Section 02204 – Earthwork.
- B. Verify compacted subgrade is acceptable and ready to support concrete and imposed loads.
- C. Verify gradients and elevations of subgrade are correct.

### 3.2 CONSTRUCTION OBSERVATION

- A. The Engineer or Project Representative will have the right to require any portion of the work be completed in their presence and if the work is covered up after such instruction, it shall be exposed by the Contractor for observation. However, if Contractor notifies the Engineer such work is scheduled, and Engineer fails to appear within 48-hours, the Contractor may proceed. All work completed, and materials furnished shall be subject to review by the Engineer or Project Representative. Improper work shall be reconstructed. All materials, which do not conform to the requirements of the specifications, shall be removed from the work upon notice being received from Engineer for rejection of such materials. Engineer shall have the right to mark rejected materials to distinguish them as such.

### 3.3 SUBGRADE

- A. Prepare subgrade in accordance with Section 02204 – Earthwork.

### 3.4 PREPARATION FOR PLACING

- A. Water shall be removed from excavations before concrete is deposited. Hardened concrete debris and other foreign materials shall be removed from the interior of forms and inside of mixing and conveying equipment. The reinforcement shall be made secure in position and shall be subject to examination and acceptance.
- B. Moisten subgrade to minimize absorption of water from fresh concrete.
- C. Coat surfaces of manhole, inlet, and catch basin frames with oil to prevent bond with concrete pavement.
- D. Notify Engineer minimum 48-hours prior to commencement of concreting operations.

### **3.5 FORMING**

- A. Place and secure forms to correct location, dimension, profile, and gradient.
- B. Assemble formwork to permit easy stripping and dismantling without damaging concrete.
- C. Place joint filler in position, in straight lines. Secure to formwork during concrete placement.
- D. Forms shall be constructed to the shape, line, and grade required and shall be maintained sufficiently rigid to prevent deformation under load. Form work and details of construction joints shall conform to ACI-318, Chapter 6.

### **3.6 REINFORCEMENT**

- A. Place reinforcement as indicated on the construction plans.
- B. Interrupt reinforcement at expansion joints.

### **3.7 PLACING CONCRETE**

- A. Placing of concrete shall conform to Chapter 5 of the American Concrete Institute Standard A.C.I. 318. Concrete having attained initial set or having contained water for more than 45 minutes shall not be used in the work. Concrete shall not be dropped freely more than 5 feet. Concrete shall be mixed and placed only when the temperature is at least 40 degrees F and rising. Concrete shall be placed only upon surfaces free from frost, ice, mud and other detrimental substances or conditions. When placed on dry soil or pervious material, water proof paper or polyethylene sheeting shall be laid over surfaces to receive the concrete.
- B. Ensure reinforcement, inserts, embedded parts, formed joints and forms are not disturbed during concrete placement.
- C. Place concrete continuously over the full-width of the panel and between predetermined construction joints. Do not break or interrupt successive pours so cold joints will not occur.

- D. Place concrete to elevations indicated on the contract drawings.

### 3.8 JOINTS

- A. Place joints as indicated on the construction plans.
- B. Place joint filler between paving components and building or other appurtenances. Recess top of filler 1/8-inch.
- C. Saw cut contraction joints 3/16-inch wide at an optimum time after finishing. Cut 1/3 into depth of slab.

### 3.9 FINISHING

- A. Curbs and Gutters: Light broom parallel to gutter.
- B. Place curing compound on exposed concrete surfaces immediately after finishing. Apply in accordance with manufacturer's instructions.
- G. Accessible Routes: Surfaces shall be stable, firm, and slip resistant. Slab Finish Tolerances – Unless otherwise called out in the contract documents, finishes shall be true planes within 3/16-inch in 10-feet as determined by a 10-foot straightedge placed anywhere on the slab in any direction. Maximum variation in elevation for a level slab shall not exceed quarter of an inch (1/4") over the entire slab [or accessible route tolerances.]

### 3.10 JOINT SEALING

- A. Separate pavement from vertical surfaces with 1/2-inch-thick joint filler.
- B. Place joint filler in pavement pattern placement sequence. Set top to required elevations. Secure to resist movement by wet concrete.
- C. Extend joint filler from bottom of pavement to within 1/8-inch of finished surface.

### 3.11 TOLERANCES

- A. Section 01400 – Quality Assurance: Tolerances.
- B. General Site Concrete:
  1. Maximum Variation of Surface Flatness: 1/4-inch in 10-feet.
  2. Maximum Variation from True Position: 1/4-inch.
- C. Accessible Routes: Variation from design elevation shall not exceed 1/4-inch; however, accessible routes shall not exceed maximum ADA allowable slopes. Contractor shall remove and replace any and all portions of the accessible route that exceeds maximum ADA allowable slopes.

### 3.12 CURB AND GUTTER SECTIONS

- A. Shall be constructed as shown on the drawings and in accordance with applicable details. Subgrade below the curb and gutter sections shall be compacted to 95% density. Curb and gutter sections shall be constructed in sections of uniform length and shall not exceed 10-feet or be less than 5-feet in length. Straight edging along the edge of gutter and top of curb shall conform to those requirements for adjacent pavement but with no irregularities to exceed ¼-inch in 10-feet.
- B. If slip-form or extruded construction is used, contraction joints shall be located at intervals no greater than 10-feet by sawing the hardened concrete at the proper time. Joints shall be sawed between 4 to 8-hours after placing of concrete. Depth of saw-cut shall be one-fourth thickness of the curb and gutter section. The maximum width of cut shall be ¼-inch. All joints shall be sawed in succession.
- C. Half inch thick premolded expansion joints shall be installed completely through the joints at spaces not to exceed 50-feet and at all structures and walks.
- D. When the curb forms are removed, backfill shall be immediately placed, tamped, and graded behind the new curb to help protect the line and grade. Machine methods of placing and forming may be used provided the finished product is satisfactory to the Engineer.
- E. Contractor shall place a concrete depressed curb at all driveways shown on the drawings or where a driveway is in use.
- F. Cracked curb and gutter will not be accepted.

### 3.13 CONCRETE CURING

- A. Immediately after placement and finishing, concrete shall be protected from moisture loss for not less than 7-days. For surfaces not in contact with forms, curing compound shall be uniformly applied after water sheen disappears from the concrete. Formed surfaces shall receive an application of curing compound if forms are removed during the 7-day curing period. Curing compound shall not be applied during rainfall.
- B. Curing compound shall be applied under pressure at the rate of 1-gallon per 150-square feet by mechanical sprayers. The spraying equipment shall be of the fully atomizing type. At the time of use, the compound shall be thoroughly mixed with a fugitive dye uniformly dispersed throughout the sprayer. Care shall be taken to prevent application to joints where concrete bond is required, to reinforcement steel and to joints where joint sealer is to be placed. The compound shall form a uniform continuous coherent film which will not crack or peel and shall be free from pinholes and other imperfections. Concrete surfaces subjected to heavy rainfall within 3 hours after curing compound has been applied shall be resprayed by above method and at above coverage at no additional expense to the Owner.

- C. No pedestrian or vehicular traffic shall be allowed over the surface for 7-days unless surface is protected by planks, plywood, or sand. Protection shall not be placed until at least 12-hours after application of the curing compound.
- D. Protect concrete by suitable methods to prevent damage by mechanical injury or excessively hot or cold temperatures.

### **3.14 FIELD QUALITY CONTROL**

- A. Section 01400 – Quality Control: Field observations and testing.
- B. Three concrete test cylinders will be taken for every 50 or less cubic yards of each class of concrete placed each day.
- C. One additional test cylinder will be taken during cold weather and cured on site under same conditions as concrete it represents.
- D. One slump test will be taken for each set of test cylinders taken.
- E. Maintain records of placed concrete items. Record date, location of pour, quantity, air temperature, and test samples taken.

### **3.15 PROTECTION**

- A. Immediately after placement, protect pavement from premature moisture loss, excessive hot or cold temperatures, and mechanical injury.
- B. Do not permit vehicular traffic over pavement or curb for seven days minimum after finishing. Do not permit pedestrian traffic over concrete for three days.

**REFERENCE ONLY**

**END OF SECTION**