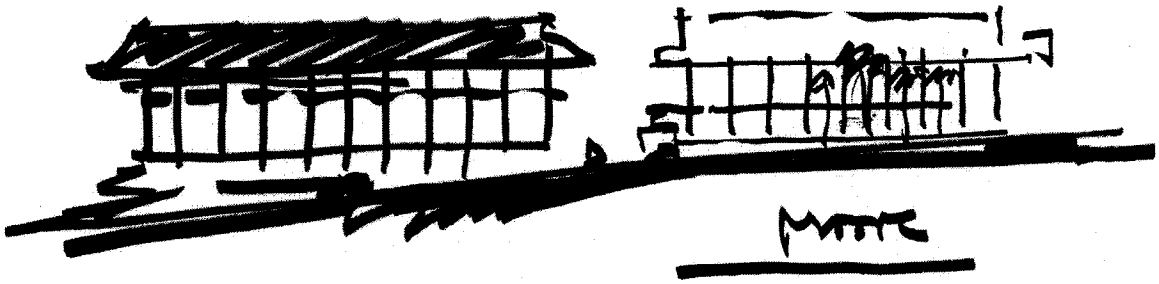
BID PACKAGE 1C: CIVIL – OCTOBER 21, 2011

SPECIFICATIONS MASTER DOCUMENT INDEX



SOUTH CAROLINA
STEVENS & WILKINSON OF SOUTH CAROLINA, INC.
No. C00226
CERTIFICATE OF AUTHORIZATION

SOUTH CAROLINA
LICENSED PROFESSIONAL ARCHITECT
No. 8279
ANDREA DEAN LAMBERTI

SOUTH CAROLINA
LICENSED PROFESSIONAL ENGINEER
No. 22786
KEITH K. EUBANKS
10/21/11

UNIVERSITY OF SOUTH CAROLINA
RAFAEL VINOLY ARCHITECTS

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PROJECT DIRECTORY

OWNER	**University of South Carolina** Campus Planning and Construction 743 Greene Street Columbia, South Carolina 29208 Telephone Number: (803) 777-5818 Fax Number: (803) 777-7334 Attention: Ms. Michelle Adams
CONSTRUCTION MANAGER	**Gilbane Cumming|SMG** 1213 Lady Street, 4th Floor Columbia, South Carolina 29201 Telephone Number: (803) 256-1989 Fax Number: (803) 254-5620 Attention: Mr. David Lindsay
ARCHITECT	**Raphael Vinoly Architects, PC** 50 Vandam Street New York, New York 10013 Telephone Number: (212) 924-5060 Fax Number: (212) 924-5858 Attention: Mr. Thomas Walther
CIVIL ENGINEER	**Stevens & Wilkinson** 1501 Main Street Columbia, South Carolina 29201 Telephone Number: (803) 765-0320 Fax Number: (803) 254-6209 Attention: Mr. Kevin Eubanks
LANDSCAPE ARCHITECT	**Grimball-Cotterill & Associates** 600 Beltline Boulevard Columbia, South Carolina 29205 Telephone Number: (803) 738-9525 Fax Number: (803) 782-3916 Attention: Ms. Emily Jones

FOODSERVICE DESIGN	**William Caruso and Associates** 8055 East Tufts Ave, Suite 1320 Denver, CO 80237 Telephone Number: (303) 649-1600 Fax Number: (303) 649-1660 Attention: Mr. Phillip Landgraf
STRUCTURAL ENGINEER	**Stevens & Wilkinson** 1501 Main Street Columbia, South Carolina 29201 Telephone Number: (803) 765-0320 Fax Number: (803) 254-6209 Attention: Ms. Michelle Motchos
PLUMBING ENGINEER	**Stevens & Wilkinson** 1501 Main Street Columbia, South Carolina 29201 Telephone Number: (803) 765-0320 Fax Number: (803) 254-6209 Attention: Mr. Eric Smith
MECHANICAL ENGINEER	**Stevens & Wilkinson** 1501 Main Street Columbia, South Carolina 29201 Telephone Number: (803) 765-0320 Fax Number: (803) 254-6209 Attention: Mr. Eric Smith
FIRE PROTECTION ENGINEER	**Stevens & Wilkinson** 1501 Main Street Columbia, South Carolina 29201 Telephone Number: (803) 765-0320 Fax Number: (803) 254-6209 Attention: Mr. Eric Smith
ELECTRICAL ENGINEER	**Stevens & Wilkinson** 1501 Main Street Columbia, South Carolina 29201 Telephone Number: (803) 765-0320 Fax Number: (803) 254-6209 Attention: Mr. Mark Nicolai

DIVISION 0 – PROCUREMENT AND CONTRACTING REQUIREMENTS

SE-310 **2011 Edition**

REQUEST FOR ADVERTISEMENT

PROJECT NAME: Darla Moore School of Business Construction – Bid Package 1C - Civil

PROJECT NUMBER: H27-6069-AC-1C

PROJECT LOCATION: University of South Carolina

Contractor may be subject to performance appraisal at close of project

BID SECURITY REQUIRED? Yes X No ☐

PERFORMANCE & PAYMENT BONDS REQUIRED? Yes X No ☐

CONSTRUCTION COST RANGE: $1,900,000 to $2,500,000

DESCRIPTION OF PROJECT: The Project consists of civil work associated with the construction of a new Business School for USC in Columbia, SC. The Project includes, but is not limited to: clearing, sediment and erosion control, selective demolition, earthwork, temporary and permanent shoring, storm drainage, site utilities, final grading, and asphalt and concrete paving. Prime bidders must be licensed as General Contractors – Highway, subclassification Grading.
This is a designated contract directed towards certified South Carolina based minority firms to satisfy the MINORITY BUSINESS goal of the Agency. However, this does not prevent other firms from bidding on this project.

A/E NAME: Rafael Vinoly Architects PC

A/E CONTACT: Thomas Walther

A/E ADDRESS: Street/PO Box: 50 Vandam Street
City: New York
State: NY ZIP: 10013-1102

EMAIL: TWalther@rvapc.com

TELEPHONE: 212-924-5060

FAX: 212-924-5858

All questions & correspondence concerning this Invitation shall be addressed to the A/E.

BIDDING DOCUMENTS/PLANS MAY BE OBTAINED FROM: See online website below.

PLAN DEPOSIT AMOUNT: $0.00 **IS DEPOSIT REFUNDABLE: N/A**

Only those Bidding Documents/Plans obtained from the above listed source(s) are official. Bidders rely on copies of Bidding Documents/Plans obtained from any other source at their own risk.

BIDDING DOCUMENTS/PLANS ARE ALSO ON FILE FOR VIEWING PURPOSES ONLY AT:

http://purchasing.sc.edu/ SEE: Facilities/Construction Solicitations & Awards

Two copies of plans and specs will be on file at USC 743 Greene Street for review by appointment only

AGC - Columbia, SC and Charlotte, NC

Offices of the Architect (RMF), Construction Manager (Cumming|SMG) and Brownstone Construction Group

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PRE-BID CONFERENCE? Yes X No ☐ MANDATORY ATTENDANCE? Yes ☐ No X

DATE: November 8, 2011 **TIME:** 10:00 AM EST **PLACE:** Conference Room 53, 743 Greene Street, Columbia, SC 29208

AGENCY: University of South Carolina

NAME OF AGENCY PROCUREMENT OFFICER: Michelle Adams

ADDRESS: Street/PO Box: 743 Greene Street
City: Columbia
State: SC ZIP: 29208-

EMAIL: mdadams@fmc.sc.edu

TELEPHONE: 803-777-0981

FAX: 803-777-8739

BID CLOSING DATE: November 22, 2011 **TIME:** 2:00 PM EST **LOCATION:** 743 Greene Street, Columbia, SC 29208.

BID DELIVERY ADDRESSES:

HAND-DELIVERY: Attn: Michelle Adams
Campus Planning and Construction
743 Greene Street
Columbia, SC 29208

MAIL SERVICE: Attn: Michelle Adams
Campus Planning and Construction
743 Greene Street
Columbia, SC 29208

SE-310

2011 Edition

REQUEST FOR ADVERTISEMENT

IS PROJECT WITHIN AGENCY CONSTRUCTION CERTIFICATION? ***(Agency MUST check one)*** **Yes X No ☐**

APPROVED BY *(Office of State Engineer)*: _____ **DATE:** 10-21-11

INSTRUCTIONS TO BIDDERS

PART 1 GENERAL

1.1 INSTRUCTIONS TO BIDDERS

A. The form is AIA A701 – 2007 Edition

B. A sample copy of the agreement is available for viewing. Contact the office of the Construction Management Advisor.

PART 2 - PRODUCTS

(Not Used)

PART 3 - EXECUTION

(Not Used)

END OF SECTION

OSE FORM 00201
STANDARD SUPPLEMENTAL INSTRUCTIONS TO BIDDERS

OWNER: University of South Carolina
PROJECT NUMBER: H27-6069-AC-1C
PROJECT NAME: Darla Moore School of Business Construction - Bid Package 1C - Civil
PROJECT LOCATION: University of South Carolina

PROCUREMENT OFFICER: Michelle Adams

1. STANDARD SUPPLEMENTAL INSTRUCTIONS TO BIDDERS

1.1. These Standard Supplemental Instructions To Bidders amend or supplement Instructions To Bidders (AIA Document A701-1997) and other provisions of Bidding and Contract Documents as indicated below.

1.2. Compliance with these Standard Supplemental Instructions is required by the Office of State Engineer (OSE) for all State projects when competitive sealed bidding is used as the method of procurement.

1.3. All provisions of A701-1997, which are not so amended or supplemented, remain in full force and effect.

1.4. Bidders are cautioned to carefully examine the Bidding and Contract Documents for additional instructions or requirements.

2. MODIFICATIONS TO A701-1997

2.1. *Delete Section 1.1 and insert the following:*

> **1.1** Bidding Documents, collectively referred to as the **Invitation for Bids**, include the Bidding Requirements and the proposed Contract Documents. The Bidding Requirements consist of the Advertisement, Instructions to Bidders (A-701), Supplementary Instructions to Bidders, the bid form (SE-330), the Intent to Award Notice (SE-370), and other sample bidding and contract forms. The proposed Contract Documents consist of the form of Agreement between the Owner and Contractor, Conditions of the Contract (General, Supplementary and other Conditions), Drawings, Specifications, all Addenda issued prior to execution of the Contract, and other documents set forth in the Bidding Documents. Any reference in this document to the Agreement between the Owner and Contractor, AIA Document A101, or some abbreviated reference thereof, shall mean the AIA A101, 2007 Edition as modified by OSE Form 00501 – Standard Modification to Agreement Between Owner and Contractor. Any reference in this document to the General Conditions of the Contract for Construction, AIA Document A201, or some abbreviated reference thereof, shall mean the AIA A201, 2007 Edition as modified by OSE Form 00811 – Standard Supplementary Conditions.

2.2. *In Section 1.8, delete the words "and who meets the requirements set forth in the Bidding Documents".*

2.3. *In Section 2.1, delete the word "making" and substitute the word "submitting."*

2.4. *In Section 2.1.1:*

After the words "Bidding Documents," delete the word "or" and substitute the word "and."

Insert the following at the end of this section:
Bidders are expected to examine the Bidding Documents and Contract Documents thoroughly and should request an explanation of any ambiguities, discrepancies, errors, omissions, or conflicting statements. Failure to do so will be at the Bidder's risk. Bidder assumes responsibility for any patent ambiguity that Bidder does not bring to the Owner's attention prior to bid opening.

2.5. *In Section 2.1.3, insert the following after the term "Contract Documents" and before the period:*
and accepts full responsibility for any pre-bid existing conditions that would affect the Bid that could have been ascertained by a site visit. As provided in Regulation 19-445.2042(B), A bidder's failure to attend an advertised pre-bid conference will not excuse its responsibility for estimating properly the difficulty and cost of successfully performing the work, or for proceeding to successfully perform the work without additional expense to the State.

OSE FORM 00201
STANDARD SUPPLEMENTAL INSTRUCTIONS TO BIDDERS

2.6. *Insert the following Sections 2.2 through 2.6:*

2.2 CERTIFICATION OF INDEPENDENT PRICE DETERMINATION

GIVING FALSE, MISLEADING, OR INCOMPLETE INFORMATION ON THIS CERTIFICATION MAY RENDER YOU SUBJECT TO PROSECUTION UNDER SECTION 16-9-10 OF THE SOUTH CAROLINA CODE OF LAWS AND OTHER APPLICABLE LAWS.

(a) By submitting an bid, the bidder certifies that—

(1) The prices in this bid have been arrived at independently, without, for the purpose of restricting competition, any consultation, communication, or agreement with any other bidder or competitor relating to—

(i) Those prices;
(ii) The intention to submit an bid; or
(iii) The methods or factors used to calculate the prices offered.

(2) The prices in this bid have not been and will not be knowingly disclosed by the bidder, directly or indirectly, to any other bidder or competitor before bid opening (in the case of a sealed bid solicitation) or contract award (in the case of a negotiated solicitation) unless otherwise required by law; and

(3) No attempt has been made or will be made by the bidder to induce any other concern to submit or not to submit an bid for the purpose of restricting competition.

(b) Each signature on the bid is considered to be a certification by the signatory that the signatory—

(1) Is the person in the bidder's organization responsible for determining the prices being offered in this bid, and that the signatory has not participated and will not participate in any action contrary to paragraphs (a)(1) through (a)(3) of this certification; or

(2)(i) Has been authorized, in writing, to act as agent for the bidder's principals in certifying that those principals have not participated, and will not participate in any action contrary to paragraphs (a)(1) through (a)(3) of this certification [As used in this subdivision (b)(2)(i), the term "principals" means the person(s) in the bidder's organization responsible for determining the prices offered in this bid];

(ii) As an authorized agent, does certify that the principals referenced in subdivision (b)(2)(i) of this certification have not participated, and will not participate, in any action contrary to paragraphs (a)(1) through (a)(3) of this certification; and

(iii) As an agent, has not personally participated, and will not participate, in any action contrary to paragraphs (a)(1) through (a)(3) of this certification.

(c) If the bidder deletes or modifies paragraph (a)(2) of this certification, the bidder must furnish with its offer a signed statement setting forth in detail the circumstances of the disclosure.

2.3 DRUG FREE WORKPLACE

By submitting a bid, the Bidder certifies that Bidder will maintain a drug free workplace in accordance with the requirements of Title 44, Chapter 107 of South Carolina Code of Laws, as amended.

2.4 CERTIFICATION REGARDING DEBARMENT AND OTHER RESPONSIBILITY MATTERS

(a) (1) By submitting an Bid, Bidder certifies, to the best of its knowledge and belief, that-

(i) Bidder and/or any of its Principals-

(A) Are not presently debarred, suspended, proposed for debarment, or declared ineligible for the award of contracts by any state or federal agency;

(B) Have not, within a three-year period preceding this bid, been convicted of or had a civil judgment rendered against them for: commission of fraud or a criminal offense in

connection with obtaining, attempting to obtain, or performing a public (Federal, state, or local) contract or subcontract; violation of Federal or state antitrust statutes relating to the submission of bids; or commission of embezzlement, theft, forgery, bribery, falsification or destruction of records, making false statements, tax evasion, or receiving stolen property; and

(C) Are not presently indicted for, or otherwise criminally or civilly charged by a governmental entity with, commission of any of the offenses enumerated in paragraph (a)(1)(i)(B) of this provision.

(ii) Bidder has not, within a three-year period preceding this bid, had one or more contracts terminated for default by any public (Federal, state, or local) entity.

(2) "Principals," for the purposes of this certification, means officers; directors; owners; partners; and, persons having primary management or supervisory responsibilities within a business entity (e.g., general manager; plant manager; head of a subsidiary, division, or business segment, and similar positions).

(b) Bidder shall provide immediate written notice to the Procurement Officer if, at any time prior to contract award, Bidder learns that its certification was erroneous when submitted or has become erroneous by reason of changed circumstances.

(c) If Bidder is unable to certify the representations stated in paragraphs (a)(1), Bid must submit a written explanation regarding its inability to make the certification. The certification will be considered in connection with a review of the Bidder's responsibility. Failure of the Bidder to furnish additional information as requested by the Procurement Officer may render the Bidder nonresponsible.

(d) Nothing contained in the foregoing shall be construed to require establishment of a system of records in order to render, in good faith, the certification required by paragraph (a) of this provision. The knowledge and information of an Bidder is not required to exceed that which is normally possessed by a prudent person in the ordinary course of business dealings.

(e) The certification in paragraph (a) of this provision is a material representation of fact upon which reliance was placed when making award. If it is later determined that the Bidder knowingly or in bad faith rendered an erroneous certification, in addition to other remedies available to the State, the Procurement Officer may terminate the contract resulting from this solicitation for default.

2.5 ETHICS CERTIFICATE

By submitting a bid, the bidder certifies that the bidder has and will comply with, and has not, and will not, induce a person to violate Title 8, Chapter 13 of the South Carolina Code of Laws, as amended (ethics act). The following statutes require special attention: Section 8-13-700, regarding use of official position for financial gain; Section 8-13-705, regarding gifts to influence action of public official; Section 8-13-720, regarding offering money for advice or assistance of public official; Sections 8-13-755 and 8-13-760, regarding restrictions on employment by former public official; Section 8-13-775, prohibiting public official with economic interests from acting on contracts; Section 8-13-790, regarding recovery of kickbacks; Section 8-13-1150, regarding statements to be filed by consultants; and Section 8-13-1342, regarding restrictions on contributions by contractor to candidate who participated in awarding of contract. The state may rescind any contract and recover all amounts expended as a result of any action taken in violation of this provision. If contractor participates, directly or indirectly, in the evaluation or award of public contracts, including without limitation, change orders or task orders regarding a public contract, contractor shall, if required by law to file such a statement, provide the statement required by Section 8-13-1150 to the procurement officer at the same time the law requires the statement to be filed.

2.6 RESTRICTIONS APPLICABLE TO BIDDERS & GIFTS

Violation of these restrictions may result in disqualification of your bid, suspension or debarment, and may constitute a violation of the state Ethics Act. (a) After issuance of the solicitation, ***bidder agrees not to discuss this procurement activity in any way with the Owner or its employees, agents or officials.*** All communications must be solely with the Procurement Officer. This restriction may be lifted by express written permission from the Procurement Officer. This restriction expires once a contract has been formed. (b) Unless otherwise approved in writing by the Procurement

Officer, ***bidder agrees not to give anything to the Owner, any affiliated organizations, or the employees, agents or officials of either, prior to award.*** (c) Bidder acknowledges that the policy of the State is that a governmental body should not accept or solicit a gift, directly or indirectly, from a donor if the governmental body has reason to believe the donor has or is seeking to obtain contractual or other business or financial relationships with the governmental body. Regulation 19-445.2165(C) broadly defines the term donor.

2.7. *Delete Section 3.1.1 and substitute the following:*

3.1.1 Bidders may obtain complete sets of the Bidding Documents from the issuing office designated in the Advertisement in the number and for the deposit sum, if any, stated therein. If so provided in the Advertisement, the deposit will be refunded to all plan holders who return the Bidding Documents in good condition within ten days after receipt of Bids. The cost of replacement of missing or damaged documents will be deducted from the deposit. A Bidder receiving a Contract award may retain the Bidding Documents and the Bidder's deposit will be refunded.

2.8. *Delete the language of Section 3.1.2 and insert the word "Reserved."*

2.9. *In Section 3.1.4, delete the words "and Architect may make" and substitute the words "has made."*

2.10. *Insert the following Section 3.1.5*

3.1.5 All persons obtaining Bidding Documents from the issuing office designated in the Advertisement shall provide that office with Bidder's contact information to include the Bidder's name, telephone number, mailing address, and email address.

2.11. *In Section 3.2.2:*

Delete the words "and Sub-bidders"

Delete the word "seven" and substitute the word "ten"

2.12. *In Section 3.2.3:*

In the first Sentence, insert the word "written" before the word "Addendum."

Insert the following at the end of the section:

As provided in Regulation 19-445.2042(B), nothing stated at the pre-bid conference shall change the Bidding Documents unless a change is made by written Addendum.

2.13. *Insert the following at the end of Section 3.3.1:*

Reference in the Bidding Documents to a designated material, product, thing, or service by specific brand or trade name followed by the words "or equal" and "or approved equal" shall be interpreted as establishing a standard of quality and shall not be construed as limiting competition.

2.14. *Delete Section 3.3.2 and substitute the following:*

3.3.2 No request to substitute materials, products, or equipment for materials, products, or equipment described in the Bidding Documents and no request for addition of a manufacturer or supplier to a list of approved manufacturers or suppliers in the Bidding Documents will be considered prior to receipt of Bids unless written request for approval has been received by the Architect at least ten days prior to the date for receipt of Bids established in the Invitation for Bids. Any subsequent extension of the date for receipt of Bids by addendum shall not extend the date for receipt of such requests unless the addendum so specifies. Such requests shall include the name of the material or equipment for which it is to be substituted and a complete description of the proposed substitution including drawings, performance and test data, and other information necessary for an evaluation. A statement setting forth changes in other materials, equipment or other portions of the Work, including changes in the work of other contracts that incorporation of the proposed substitution would require, shall be included. The burden of proof of the merit of the proposed substitution is upon the proposer. The Architect's decision of approval or disapproval of a proposed substitution shall be final.

2.15. *Delete Section 3.4.3 and substitute the following:*

3.4.3 Addenda will be issued no later than 120 hours prior to the time for receipt of Bids except an Addendum withdrawing the request for Bids or one which includes postponement of the date for receipt of Bids.

OSE FORM 00201
STANDARD SUPPLEMENTAL INSTRUCTIONS TO BIDDERS

2.16. *Insert the following Sections 3.4.5 and 3.4.6:*

3.4.5 When the date for receipt of Bids is to be postponed and there is insufficient time to issue a written Addendum prior to the original Bid Date, Owner will notify prospective Bidders by telephone or other appropriate means with immediate follow up with a written Addendum. This Addendum will verify the postponement of the original Bid Date and establish a new Bid Date. The new Bid Date will be no earlier than the fifth (5th) calendar day after the date of issuance of the Addendum postponing the original Bid Date.

3.4.6. If an emergency or unanticipated event interrupts normal government processes so that bids cannot be received at the government office designated for receipt of bids by the exact time specified in the solicitation, the time specified for receipt of bids will be deemed to be extended to the same time of day specified in the solicitation on the first work day on which normal government processes resume. In lieu of an automatic extension, an Addendum may be issued to reschedule bid opening. If state offices are closed at the time a pre-bid or pre-proposal conference is scheduled, an Addendum will be issued to reschedule the conference. Useful information may be available at: http://www.scemd.org/scgovweb/weather_alert.html

2.17. *In Section 4.1.1, delete the word "forms" and substitute the words "SE-330 Bid Form."*

2.18. *Delete Section 4.1.2 and substitute the following:*

4.1.2 Any blanks on the bid form to be filled in by the Bidder shall be legibly executed in a non-erasable medium. Bids shall be signed in ink or other indelible media.

2.19. *Delete Section 4.1.3 and substitute the following:*

4.1.3 Sums shall be expressed in figures.

2.20. *Insert the following at the end of Section 4.1.4:*

Bidder shall not make stipulations or qualify his bid in any manner not permitted on the bid form. An incomplete Bid or information not requested that is written on or attached to the Bid Form that could be considered a qualification of the Bid, may be cause for rejection of the Bid.

2.21. *Delete Section 4.1.5 and substitute the following:*

4.1.5 All requested Alternates shall be bid. The failure of the bidder to indicate a price for an Alternate shall render the Bid non-responsive. Indicate the change to the Base Bid by entering the dollar amount and marking, as appropriate, the box for "ADD TO" or "DEDUCT FROM". If no change in the Base Bid is required, enter "ZERO" or "No Change." For add alternates to the base bid, Subcontractor(s) listed on page BF-2 of the Bid Form to perform Alternate Work may be used for both Alternates and Base Bid Work if Alternates are accepted.

2.22. *Delete Section 4.1.6 and substitute the following:*

4.1.6 Pursuant to Title 11, Chapter 35, Section 3020(b)(i) of the South Carolina Code of Laws, as amended, Section 7 of the Bid Form sets forth a list of subcontractor specialties for which Bidder is required to list only the subcontractors Bidder will use to perform the work of each listed specialty. Bidder must follow the Instructions in the Bid Form for filling out this section of the Bid Form. Failure to properly fill out Section 7 may result in rejection of Bidder's bid as non-responsive.

2.23. *Delete Section 4.1.7 and substitute the following:*

4.1.7 Each copy of the Bid shall state the legal name of the Bidder and the nature of legal form of the Bidder. Each copy shall be signed by the person or persons legally authorized to bind the Bidder to a contract. A Bid submitted by an agent shall have a current power of attorney attached certifying the agent's authority to bind the Bidder.

2.24. *Delete Section 4.2.1 and substitute the following:*

4.2.1 If required by the Invitation for Bids, each Bid shall be accompanied by a bid security in an amount of not less than five percent of the Base Bid. The bid security shall be a bid bond or a certified cashier's check. The Bidder pledges to enter into a Contract with the Owner on the terms stated in the Bid and will, if required, furnish bonds covering the faithful performance of the Contract and payment of all obligations arising thereunder. Should the Bidder refuse to enter into such Contract or fail to furnish such bonds if required, the amount of the bid security shall be forfeited to the Owner as liquidated damages, not as a penalty.

OSE FORM 00201
STANDARD SUPPLEMENTAL INSTRUCTIONS TO BIDDERS

2.25. *Delete Section 4.2.2 and substitute the following:*

4.2.2 If a surety bond is required, it shall be written on AIA Document A310, Bid Bond, and the attorney-in-fact who executes the bond on behalf of the surety shall affix to the bond a certified and current copy of the power of attorney. The bid bond shall:

- **.1** Be issued by a surety company licensed to do business in South Carolina;
- **.2** Be issued by a surety company having, at a minimum, a "Best Rating" of "A" as stated in the most current publication of "Best's Key Rating Guide, Property-Casualty", which company shows a financial strength rating of at least five (5) times the contract price.
- **.3** Be enclosed in the bid envelope at the time of Bid Opening, either in paper copy or as an electronic bid bond authorization number provided on the Bid Form and issued by a firm or organization authorized by the surety to receive, authenticate and issue binding electronic bid bonds on behalf the surety.

2.26. *Delete Section 4.2.3 and substitute the following:*

4.2.3 By submitting a bid bond via an electronic bid bond authorization number on the Bid Form and signing the Bid Form, the Bidder certifies that an electronic bid bond has been executed by a Surety meeting the standards required by the Bidding Documents and the Bidder and Surety are firmly bound unto the State of South Carolina under the conditions provided in this Section 4.2.

2.27. *Insert the following Section 4.2.4:*

4.2.4 The Owner will have the right to retain the bid security of Bidders to whom an award is being considered until either (a) the Contract has been executed and performance and payment bonds, if required, have been furnished, or (b) the specified time has elapsed so that Bids may be withdrawn or (c) all Bids have been rejected.

2.28. *Delete Section 4.3.1 and substitute the following:*

4.3.1 All copies of the Bid, the bid security, if any, and any other documents required to be submitted with the Bid shall be enclosed in a sealed opaque envelope. The envelope shall, unless hand delivered by the Bidder, be addressed to the Owner's designated purchasing office as shown in the Invitation for Bids. The envelope shall be identified with the Project name, the Bidder's name and address and, if applicable, the designated portion of the Work for which the Bid is submitted. If the Bid is sent by mail or special delivery service (UPS, Federal Express, etc.), the envelope should be labeled "BID ENCLOSED" on the face thereof. Bidders hand delivering their Bids shall deliver Bids to the place of the Bid Opening as shown in the Invitation for Bids. Whether or not Bidders attend the Bid Opening, they shall give their Bids to the Owner's procurement officer or his/her designee as shown in the Invitation for Bids prior to the time of the Bid Opening.

2.29. *Insert the following Section 4.3.6 and substitute the following:*

4.3.5 The official time for receipt of Bids will be determined by reference to the clock designated by the Owner's procurement officer or his/her designee. The procurement officer conducting the Bid Opening will determine and announce that the deadline has arrived and no further Bids or bid modifications will be accepted. All Bids and bid modifications in the possession of the procurement officer at the time the announcement is completed will be timely, whether or not the bid envelope has been date/time stamped or otherwise marked by the procurement officer.

2.30. *Delete Section 4.4.2 and substitute the following:*

4.4.2 Prior to the time and date designated for receipt of Bids, a Bid submitted may be withdrawn in person or by written notice to the party receiving Bids at the place designated for receipt of Bids. Withdrawal by written notice shall be in writing over the signature of the Bidder.

2.31. *In Section 5.1, delete everything following the caption "OPENING OF BIDS" and substitute the following:*

5.1.1 Bids received on time will be publicly opened and will be read aloud. Owner will not read aloud Bids that Owner determines, at the time of opening, to be non-responsive. .

5.1.2 At bid opening, Owner will announce the date and location of the posting of the Notice of Intended Award.

5.1.3 Owner will send a copy of the final Bid Tabulation to all Bidders within ten (10) working days of the Bid Opening.

5.1.4 If Owner determines to award the Project, Owner will, after posting a Notice of Intended Award, send a copy of the Notice to all Bidders.

5.1.5 If only one Bid is received, Owner will open and consider the Bid.

2.32. *In Section 5.2, insert the section number "5.2.1" before the words of the "The Owner" at the beginning of the sentence.*

2.33. *Insert the following Sections 5.2.2 and 5.2.3:*

5.2.2 The reasons for which the Owner will reject Bids include, but are not limited to:

- **.1** Failure by a Bidder to be represented at a Mandatory Pre-Bid Conference or site visit;
- **.2** Failure to deliver the Bid on time;
- **.3** Failure to comply with Bid Security requirements, except as expressly allowed by law;
- **.4** Listing an invalid electronic Bid Bond authorization number on the bid form;
- **.5** Failure to Bid an Alternate, except as expressly allowed by law;
- **.6** Failure to list qualified Subcontractors as required by law;
- **.7** Showing any material modification(s) or exception(s) qualifying the Bid;
- **.8** Faxing a Bid directly to the Owner or their representative; or
- **.9** Failure to include a properly executed Power-of-Attorney with the bid bond.

5.2.3 The Owner may reject a Bid as nonresponsive if the prices bid are materially unbalanced between line items or sub-line items. A bid is materially unbalanced when it is based on prices significantly less than cost for some work and prices which are significantly overstated in relation to cost for other work, and if there is a reasonable doubt that the bid will result in the lowest overall cost to the Owner even though it may be the low evaluated bid, or if it is so unbalanced as to be tantamount to allowing an advance payment.

2.34. *Delete Section 6.1 and substitute the following:*

6.1 CONTRACTOR'S RESPONSIBILITY

Owner will make a determination of Bidder's responsibility before awarding a contract. Bidder shall provide all information and documentation requested by the Owner to support the Owner's evaluation of responsibility. Failure of Bidder to provide requested information is cause for the Owner, at its option, to determine the Bidder to be non-responsible

2.35. *Delete the language of Section 6.2 and insert the word "Reserved."*

2.36. *Delete the language of Sections 6.3.2, 6.3.3, and 6.3.4 and insert the word "Reserved" after each Section Number.*

2.37. *Insert the following Section 6.4*

6.4 CLARIFICATION

Pursuant to Section 11-35-1520(8), the Procurement Officer may elect to communicate with a Bidder after opening for the purpose of clarifying either the Bid or the requirements of the Invitation for Bids. Such communications may be conducted only with Bidders who have submitted a Bid which obviously conforms in all material aspects to the Invitation for Bids and only in accordance with Appendix D (Paragraph A(6)) to the Manual for Planning and Execution of State Permanent Improvement, Part II. Clarification of a Bid must be documented in writing and included with the Bid. Clarifications may not be used to revise a Bid or the Invitation for Bids. [Section 11-35-1520(8); R.19-445.2080]

2.38. *Delete Section 7.1.2 and substitute the following:*

7.1.2 The performance and payment bonds shall conform to the requirements of Section 11.4 of the General Conditions of the Contract. If the furnishing of such bonds is stipulated in the Bidding Documents, the cost shall be included in the Bid.

2.39. *Delete the language of Section 7.1.3 and insert the word "Reserved."*

2.40. *In Section 7.2, insert the words "CONTRACT, CERTIFICATES OF INSURANCE" into the caption after the word "Delivery."*

OSE FORM 00201
STANDARD SUPPLEMENTAL INSTRUCTIONS TO BIDDERS

2.41. *Delete Section 7.2.1 and substitute the following:*

7.2.1 After expiration of the protest period, the Owner will tender a signed Contract for Construction to the Bidder and the Bidder shall return the fully executed Contract for Construction to the Owner within seven days thereafter. The Bidder shall deliver the required bonds and certificate of insurance to the Owner not later than three days following the date of execution of the Contract. Failure to deliver these documents as required shall entitle the Owner to consider the Bidder's failure as a refusal to enter into a contract in accordance with the terms and conditions of the Bidder's Bid and to make claim on the Bid Security for re-procurement cost.

2.42. *Delete the language of Section 7.2.2 and insert the word "Reserved."*

2.43. *Delete the language of Article 8 and insert the following:*

Unless otherwise required in the Bidding Documents, the Agreement for the Work will be written on South Carolina Modified AIA Document A101, 2007, Standard Form of Agreement Between Owner and Contractor as modified by OSE Form 00501 – Standard Modification to Agreement Between Owner and Contractor.

2.44. *Insert the following Article 9:*

ARTICLE 9 MISCELLANEOUS

9.1 NONRESIDENT TAXPAYER REGISTRATION AFFIDAVIT INCOME TAX WITHHOLDING

IMPORTANT TAX NOTICE - NONRESIDENTS ONLY

Withholding Requirements for Payments to Nonresidents: Section 12-8-550 of the South Carolina Code of Laws requires persons hiring or contracting with a nonresident conducting a business or performing personal services of a temporary nature within South Carolina to withhold 2% of each payment made to the nonresident. The withholding requirement does not apply to (1) payments on purchase orders for tangible personal property when the payments are not accompanied by services to be performed in South Carolina, (2) nonresidents who are not conducting business in South Carolina, (3) nonresidents for contracts that do not exceed $10,000 in a calendar year, or (4) payments to a nonresident who (a) registers with either the S.C. Department of Revenue or the S.C. Secretary of State and (b) submits a Nonresident Taxpayer Registration Affidavit - Income Tax Withholding, Form I-312 to the person letting the contract.

For information about other withholding requirements (e.g., employee withholding), contact the Withholding Section at the South Carolina Department of Revenue at 803-898-5383 or visit the Department's website at: www.sctax.org

This notice is for informational purposes only. This Owner does not administer and has no authority over tax issues. All registration questions should be directed to the License and Registration Section at 803-898-5872 or to the South Carolina Department of Revenue, Registration Unit, Columbia, S.C. 29214-0140. All withholding questions should be directed to the Withholding Section at 803-898- 5383.

PLEASE SEE THE "NONRESIDENT TAXPAYER REGISTRATION AFFIDAVIT INCOME TAX WITHHOLDING" FORM (FORM NUMBER I-312) LOCATED AT: **http://www.sctax.org/Forms+and+Instructions/withholding/default.htm .**

9.2 CONTRACTOR LICENSING

Contractors and Subcontractors listed in Section 7 of the Bid Form who are required by the South Carolina Code of Laws to be licensed, must be licensed at the time of bidding.

9.3 SUBMITTING CONFIDENTIAL INFORMATION

For every document Bidder submits in response to or with regard to this solicitation or request, Bidder must separately mark with the word "CONFIDENTIAL" every page, or portion thereof, that Bidder contends contains information that is exempt from public disclosure because it is either (a) a trade secret as defined in Section 30-4-40(a)(1), or (b) privileged & confidential, as that phrase is used in Section 11-35-410. For every document Bidder submits in response to or with regard to this solicitation or request, Bidder must separately mark with the words "TRADE SECRET" every page, or portion thereof, that Bidder contends contains a trade secret as that term is defined by Section 39-8-20 of the Trade Secrets Act. For every document Bidder submits in response to or with regard to this solicitation or request, Bidder must separately mark with the word "PROTECTED" every page, or portion thereof, that Bidder contends is protected by Section 11-35-1810. All markings must be conspicuous; use color, bold, underlining, or some other method in order to conspicuously distinguish the mark from the other text. Do not mark your entire bid as confidential, trade secret, or protected! If your bid, or any part thereof, is improperly marked as confidential or trade

secret or protected, the State may, in its sole discretion, determine it nonresponsive. If only portions of a page are subject to some protection, do not mark the entire page. By submitting a response to this solicitation, Bidder (1) agrees to the public disclosure of every page of every document regarding this solicitation or request that was submitted at any time prior to entering into a contract (including, but not limited to, documents contained in a response, documents submitted to clarify a response, & documents submitted during negotiations), unless the page is conspicuously marked "TRADE SECRET" or "CONFIDENTIAL" or "PROTECTED", (2) agrees that any information not marked, as required by these bidding instructions, as a "Trade Secret" is not a trade secret as defined by the Trade Secrets Act, & (3) agrees that, notwithstanding any claims or markings otherwise, any prices, commissions, discounts, or other financial figures used to determine the award, as well as the final contract amount, are subject to public disclosure. In determining whether to release documents, the State will detrimentally rely on Bidders's marking of documents, as required by these bidding instructions, as being either "Confidential" or "Trade Secret" or "PROTECTED". By submitting a response, Bidder agrees to defend, indemnify & hold harmless the State of South Carolina, its officers & employees, from every claim, demand, loss, expense, cost, damage or injury, including attorney's fees, arising out of or resulting from the State withholding information that Bidder marked as "confidential" or "trade secret" or "PROTECTED".

9.4 POSTING OF INTENT TO AWARD

Notice of Intent to Award, SE-370, will be posted at the following location:
Room or Area of Posting: Lobby
Building Where Posted: Campus Planning and Construction
Address of Building: 743 Greene Street, Columbia, SC 29208
WEB site address (if applicable): NA
Posting date will be announced at bid opening. In addition to posting the notice, the Owner will promptly send all responsive bidders a copy of the notice of intent to award and the final bid tabulation

9.5 PROTEST OF SOLICITATION OR AWARD

Any prospective bidder, offeror, contractor, or subcontractor who is aggrieved in connection with the solicitation of a contract shall protest within fifteen days of the date of issuance of the applicable solicitation document at issue. Any actual bidder, offeror, contractor, or subcontractor who is aggrieved in connection with the intended award or award of a contract shall protest within ten days of the date notification of intent to award is posted in accordance with Title 11, Chapter 35, Section 4210 of the South Carolina Code of Laws, as amended. A protest shall be in writing, shall set forth the grounds of the protest and the relief requested with enough particularity to give notice of the issues to be decided, and must be received by the State Engineer within the time provided.
Any protest must be addressed to the CPO, Office of State Engineer, and submitted in writing:

(a) by email to protest-ose@mmo.sc.gov,
(b) by facsimile at 803-737-0639, or
(c) by post or delivery to 1201 Main Street, Suite 600, Columbia, SC 29201.

By submitting a protest to the foregoing email address, you (and any person acting on your behalf) consent to receive communications regarding your protest (and any related protests) at the e-mail address from which you sent your protest.

9.6 SOLICITATION INFORMATION FROM SOURCES OTHER THAN OFFICIAL SOURCE

South Carolina Business Opportunities (SCBO) is the official state government publication for State of South Carolina solicitations. Any information on State agency solicitations obtained from any other source is unofficial and any reliance placed on such information is at the bidder's sole risk and is without recourse under the South Carolina Consolidated Procurement Code.

9.7 BUILDER'S RISK INSURANCE

Bidder's are directed to Article 11.3 of the South Carolina Modified AIA Document A201, 2007 Edition, which, unless provided otherwise in the bid documents, requires the contractor to provide builder's risk insurance on the project.

9.8 TAX CREDIT FOR SUBCONTRACTING WITH MINORITY FIRMS

Pursuant to Section 12-6-3350, taxpayers, who utilize certified minority subcontractors, may take a tax credit equal to 4% of the payments they make to said subcontractors. The payments claimed must be based on work performed directly for a South Carolina state contract. The credit is capped at $50,000 per year or the total tax liability; whichever is lesser. The taxpayer is eligible to claim the credit for 6 consecutive taxable years beginning with the taxable year in which the credit is first claimed. There is no carry forward of unused credits. The credit may be claimed on Form TC-2, "Minority Business Credit." A copy of the subcontractor's certificate from the Governor's Office of Small and Minority Business (OSMBA) is to be attached to the contractor's income tax return. Taxpayers must maintain evidence of work performed for a State contract by the minority subcontractor. Questions regarding the tax credit and how to file are to be referred to: SC Department of Revenue, Research and Review, Phone: (803) 898-5786, Fax: (803) 898-5888. The subcontractor must be certified as to the criteria of a "Minority Firm" by the Governor's Office of Small and Minority Business Assistance (OSMBA). Certificates are issued to subcontractors upon successful completion of the certification process. Questions regarding subcontractor certification are to be referred to: Governor's Office of Small and Minority Business Assistance, Phone: (803) 734-0657, Fax: (803) 734-2498. Reference: SC §11-35-5010 – Definition for Minority Subcontractor & SC §11-35-5230 (B) – Regulations for Negotiating with State Minority Firms.

§ 9.9 OTHER SPECIAL CONDITIONS OF THE WORK

CONSTRUCTION MANAGEMENT SERVICES

It is noted that the University has employed the services of a Construction Manager for this project to act as their representative and to assist in the planning, coordination and management of project activities on behalf of the University. The Contractor shall fully cooperate with the Construction Manager in all regards. Additional information and requirements are indicated within division 1 specification sections.

END OF DOCUMENT

BID BOND

PART 1 GENERAL

1.1 BID BOND

A. The form is AIA A310 – 2010 Edition

B. A sample copy of the agreement is available for viewing. Contact the office of the Construction Manager.

PART 2 - PRODUCTS

(Not Used)

PART 3 - EXECUTION

(Not Used)

END OF SECTION

SE-330 – LUMP SUM BID
BID FORM

Bidders shall submit bids on only Bid Form SE-330.

BID SUBMITTED BY:_____
(Bidder's Name)

BID SUBMITTED TO: University of South Carolina
(Owner's Name)

FOR PROJECT: PROJECT NAME Darla Moore School of Business Construction - Bid Package 1C: Civil

PROJECT NUMBER H27-6069-AC-1C

OFFER

§ 1. In response to the Invitation for Construction Bids and in compliance with the Instructions to Bidders for the above-named Project, the undersigned Bidder proposes and agrees, if this Bid is accepted, to enter into a Contract with the Owner on the terms included in the Bidding Documents, and to perform all Work as specified or indicated in the Bidding Documents, for the prices and within the time frames indicated in this Bid and in accordance with the other terms and conditions of the Bidding Documents.

§ 2. Pursuant to Section 11-32-3030(1) of the SC Code of Laws, as amended, Bidder has submitted Bid Security as follows in the amount and form required by the Bidding Documents:

☐ Bid Bond with Power of Attorney ☐ Electronic Bid Bond ☐ Cashier's Check

(Bidder check one)

§ 3. Bidder acknowledges the receipt of the following Addenda to the Bidding Documents and has incorporated the effects of said Addenda into this Bid:

ADDENDUM No:_____

§ 4. Bidder accepts all terms and conditions of the Invitation for Bids, including, without limitation, those dealing with the disposition of Bid Security. Bidder agrees that this Bid, including all Bid Alternates, if any, may not be revoked or withdrawn after the opening of bids, and shall remain open for acceptance for a period of 60 Days following the Bid Date, or for such longer period of time that Bidder may agree to in writing upon request of the Owner.

§ 5. Bidder herewith offers to provide all labor, materials, equipment, tools of trades and labor, accessories, appliances, warranties and guarantees, and to pay all royalties, fees, permits, licenses and applicable taxes necessary to complete the following items of construction work:

§ 6.1 BASE BID WORK ***(as indicated in the Bidding Documents and generally described as follows)*:** All Civil work as shown on bid documents,

_____, which sum is hereafter called the Base Bid.

(Bidder - insert Base Bid Amount on line above)

SE-330 – LUMP SUM BID
BID FORM

§ 6.2 BID ALTERNATES - as indicated in the Bidding Documents and generally described as follows:

ALTERNATE # 1 *(Brief Description)*: Salvage two trees as shown.

☐ **ADD TO** or ☐ **DEDUCT FROM BASE BID:**_____

(Bidder to Mark appropriate box to clearly indicate the price adjustment offered for each alternate)

ALTERNATE # 2 *(Brief Description)*: NA

☐ **ADD TO** or ☐ **DEDUCT FROM BASE BID:** NA

(Bidder to Mark appropriate box to clearly indicate the price adjustment offered for each alternate)

ALTERNATE # 3 *(Brief Description)*: NA

☐ **ADD TO** or ☐ **DEDUCT FROM BASE BID:** NA

(Bidder to Mark appropriate box to clearly indicate the price adjustment offered for each alternate)

SE-330 – LUMP SUM BID
BID FORM

§ 7. Not Used.

§ 8. Not Used.

§ 9. TIME OF CONTRACT PERFORMANCE AND LIQUIDATED DAMAGES

a. CONTRACT TIME: Bidder agrees that the Date of Commencement of the Work shall be established in a Notice to Proceed to be issued by the Owner. Bidder agrees to substantially complete the Work associated with the initial phase of Work for this project within **144** calendar days from the Date of Commencement, subject to adjustments as provided in the Contract Documents. Bidder agrees to re-mobilize and commence work of the final phase of Work approximately 590 calendar days following the Date of Notice of Commencement and substantially complete the balance of work of the contract within **75** days of this date, subject to adjustments as provided in the Contract Documents.

b. LIQUIDATED DAMAGES: Bidder further agrees that from the compensation to be paid, the Owner shall retain as Liquidated Damages the sum of $2,000.00 for each calendar day the actual construction time required to achieve Substantial Completion for each phase of Work exceeds the specified or adjusted time for Substantial Completion as provided in the Contract Documents. This sum is intended by the parties as the predetermined measure of compensation for actual damages, not as a penalty for nonperformance.

§ 10. AGREEMENTS

a. Bidder agrees that this bid is subject to the requirements of the law of the State of South Carolina.

b. Bidder agrees that at any time prior to the issuance of the Notice to Proceed for this Project, this Project may be canceled for the convenience of, and without cost to, the State.

c. Bidder agrees that neither the State of South Carolina nor any of its agencies, employees or agents shall be responsible for any bid preparation costs, or any costs or charges of any type, should all bids be rejected or the Project canceled for any reason prior to the issuance of the Notice to Proceed.

§ 11. ELECTRONIC BID BOND

By signing below, the Principal is affirming that the identified electronic bid bond has been executed and that the Principal and Surety are firmly bound unto the State of South Carolina under the terms and conditions of the AIA Document A310, Bid Bond, included in the Bidding Documents.

Electronic Bid Bond Number: _____

Signature and Title: _____

SE-330 – LUMP SUM BID
BID FORM

BIDDER'S TAXPAYER IDENTIFICATION

FEDERAL EMPLOYER'S IDENTIFICATION NUMBER:_____

OR

SOCIAL SECURITY NUMBER:_____

CONTRACTOR'S CLASSIFICATIONS AND SUBCLASSIFICATIONS WITH LIMITATIONS

Classification(s)& Limits: _____

Subclassification(s) & Limits:_____

SC Contractor's License Number(s):_____

BY SIGNING THIS BID, THE PERSON SIGNING REAFFIRMS ALL REPRESENTATIONS AND CERTIFICATIONS MADE BY BOTH THE PERSON SIGNING AND THE BIDDER, INCLUDING WITHOUT LIMITATION, THOSE APPEARING IN ARTICLE 2 OF THE INSTRUCTIONS TO BIDDER. THE INVITATION FOR BIDS, AS DEFINED IN THE INSTRUCTIONS TO BIDDERS, IS EXPRESSLY INCORPORATE BY REFERENCE.

SIGNATURE

BIDDER'S LEGAL NAME: _____

ADRESS: _____

_____

BY:_____ **DATE:**_____
(Signature)

TITLE:_____

TELEPHONE:_____

EMAIL: _____

00 50 00 - OWNER AND CONTRACTOR AGREEMENT

PART 1 GENERAL

1.1 AGREEMENT

A. The agreement form is AIA A101

1.2 REFERENCE STANDARD

A. AIA A201 – General Conditions of the Contract for Construction, 2007 Edition

B. A sample copy of the agreement is available for viewing. Contact the office of the Construction Management Advisor.

PART 2 - PRODUCTS

(Not Used)

PART 3 - EXECUTION

(Not Used)

END OF SECTION 00 50 00

OSE FORM 00501
STANDARD MODIFICATIONS TO AGREEMENT BETWEEN OWNER AND CONTRACTOR

OWNER: University of South Carolina
PROJECT NUMBER: H27-6060-AC-1C
PROJECT NAME: Darla Moore School of Business Construction - Bid Package 1C: Civil

1. STANDARD MODIFICATIONS TO AIA A101-2007

1.1. These Standard Modifications amend or supplement the *Standard Form of Agreement Between Owner and Contractor* (AIA Document A101-2007) and other provisions of Bidding and Contract Documents as indicated below.

1.2. All provisions of A101-2007, which are not so amended or supplemented, remain in full force and effect.

2. MODIFICATIONS TO A101

2.1. *Insert the following at the end of Article 1:*

Any reference in this document to the Agreement between the Owner and Contractor, AIA Document A101, or some abbreviated reference thereof, shall mean the AIA A101, 2007 Edition as modified by OSE Form 00501 – Standard Modification to Agreement Between Owner and Contractor. Any reference in this document to the General Conditions of the Contract for Construction, AIA Document A201, or some abbreviated reference thereof, shall mean the AIA A201, 2007 Edition as modified by OSE Form 00811 – Standard Supplementary Conditions.

2.2. *Delete Section 3.1 and substitute the following:*

3.1 The Date of Commencement of the Work shall be the date fixed in a Notice to Proceed issued by the Owner. The Owner shall issue the Notice to Proceed to the Contractor in writing, no less than seven days prior to the Date of Commencement. Unless otherwise provided elsewhere in the contract documents, and provided the contractor has secured all required insurance and surety bonds, the contractor may commence work immediately after receipt of the Notice to Proceed.

2.3. *Delete Section 3.2 and substitute the following:*
3.2 The Contract Time shall be measured from the Date of Commencement as provided in Section 9(a) of the Bid Form (SE-330) for this Project. Contractor agrees that if the Contractor fails to achieve Substantial Completion of the Work within the Contract Time, the Owner shall be entitled to withhold or recover from the Contractor liquidated damages in the amounts set forth in Section 9(b) of the Bid Form (SE-330, subject to adjustments of this Contract Time as provided in the Contract Documents.

2.4. *In Section 5.1.1, insert the words "and Owner" after the phrase "Payment submitted to the Architect."*

2.5. *Delete Section 5.1.3 and substitute the following:*

5.1.3 The Owner shall make payment of the certified amount to the Contractor not later than 21 days after receipt of the Application for Payment.

2.6. *In Section 5.1.6, Insert the following after the phrase "Subject to other provisions of the Contract Documents":*

and subject to Title 12, Chapter 8, Section 550 of the South Carolina Code of Laws, as amended (Withholding Requirements for Payments to Non-Residents)

In the spaces provided in Sub-Sections 1 and 2 for inserting the retainage amount, insert "three and one-half percent (3.5%)."

OSE FORM 00501
STANDARD MODIFICATIONS TO AGREEMENT BETWEEN OWNER AND CONTRACTOR

2.7. *In Section 5.1.8, delete the word "follows" and the colon and substitute the following:*

set forth in S.C. Code Ann. § 11-35-3030(4).

2.8. *In Section 5.1.9, delete the words "Except with the Owner's prior approval, the" before the word " Contractor."*

2.9. *In Section 5.2.2, delete the number 30 and substitute the number 21, delete everything following the words "Certificate for Payment" and place a period at the end of the resulting sentence.*

2.10. *Delete the language of Sections 6.1 and 6.2 and substitute the word "Reserved" for the deleted language of each Section .*

2.11. *Delete the language of Section 8.2 and substitute the word "Reserved."*

2.12. *In Section 8.3, make the word "Representative" in the title plural, delete everything following the title, and substitute the following:*

8.3.1 Owner designates the individual listed below as its Senior Representative ("Owner's Senior Representative"), which individual has the responsibility for and, subject to Section 7.2.1 of the General Conditions, the authority to resolve disputes under Section 15.6 of the General Conditions:

Name: Jeff Lamberson
Title: Director, Campus Planning and Construction
Address: 743 Greene Street, Columbia, SC 29208
Telephone: 803-777-5818 **FAX:** 803-777-8739
Email: jlambers@fmc.sc.edu

8.3.2 Owner designates the individual listed below as its Owner's Representative, which individual has the authority and responsibility set forth in Section 2.1.1 of the General Conditions:

Name: Lekita Hargrave
Title: Project Manager
Address: 743 Greene Stree, Columbia, SC 29208
Telephone: 803-777-5818 **FAX:** 803-777-8739
Email: Hargrave@sc.edu

2.13. *In Section 8.4, make the word "Representative" in the title plural, delete everything following the title, and substitute the following:*

8.4.1 Contractor designates the individual listed below as its Senior Representative ("Contractor's Senior Representative"), which individual has the responsibility for and authority to resolve disputes under Section 15.6 of the General Conditions:

Name: _____
Title: _____
Address: _____
Telephone: _____ **FAX:** _____
Email: _____

OSE FORM 00501
STANDARD MODIFICATIONS TO AGREEMENT BETWEEN OWNER AND CONTRACTOR

8.4.2 Contractor designates the individual listed below as its Contractor's Representative, which individual has the authority and responsibility set forth in Section 3.1.1 of the General Conditions:

Name: _____
Title: _____
Address: _____
Telephone: _____ **FAX:** _____
Email: _____

2.14. *Add the following Section 8.6.1:*

8.6.1 The Architect's representative:

Name: Thomas Walther
Title: Project Manager
Address: 50 Vandam Street, New York, NY 10013-1102
Telephone: 212-924-5060 **FAX:** 212-924-5858
Email: TWalther@rvapc.com

2.15. *In Section 9.1.7, Sub-Section 2, list the following documents in the space provided for listing documents:*

Invitation for Construction Bids (SE-310)
Instructions to Bidders (AIA Document A701-1997)
Standard Supplemental Instructions to Bidders (OSE Form 00201)
Contractor's Bid (Completed SE-330)
Notice of Intent to Award (Completed SE-370)
Certificate of procurement authority issued by the SC Budget & Control Board

2.16. *In Article 10, delete everything after the first sentence.*

END OF DOCUMENT

00 80 00 – GENERAL CONDITIONS OF THE CONTRACT FOR CONSTRUCTION

PART 1 GENERAL

1.1 GENERAL CONDITIONS

A. The General Conditions of the Contract for Construction form is AIA A201

1.2 REFERENCE STANDARD

A. AIA A201 – General Conditions of the Contract for Construction, 2007 Edition

B. A sample copy of the form is available for viewing. Contact the office of the Construction Management Advisor.

PART 2 - PRODUCTS

(Not Used)

PART 3 - EXECUTION

(Not Used)

END OF SECTION 00 80 00

OSE FORM 00811
STANDARD SUPPLEMENTARY CONDITIONS

OWNER: University of South Carolina
PROJECT NUMBER: H27-6060-AC-1C
PROJECT NAME: Darla Moore School of Business Construction - Bid Package 1C: Civil

1 GENERAL CONDITIONS

The *General Conditions of the Contract for Construction,* AIA Document A201, 2007 Edition, Articles 1 through 15 inclusive, is a part of this Contract and is incorporated as fully as if herein set forth. For brevity, AIA Document A201 is also referred to in the Contract Documents collectively as the "General Conditions."

2 STANDARD SUPPLEMENTARY CONDITIONS

2.1 The following supplements modify, delete and/or add to the General Conditions. Where any portion of the General Conditions is modified or any paragraph, Section or clause thereof is modified or deleted by these Supplementary Conditions, the unaltered provisions of the General Conditions shall remain in effect.

2.2 Unless otherwise stated, the terms used in these Standard Supplementary Conditions which are defined in the General Conditions have the meanings assigned to them in the General Conditions.

3 MODIFICATIONS TO A201-2007

3.1 *Insert the following at the end of Section 1.1.1:*

Any reference in this document to the Agreement between the Owner and Contractor, AIA Document A101, or some abbreviated reference thereof, shall mean the AIA A101, 2007 Edition as modified by OSE Form 00501 – Standard Modification to Agreement Between Owner and Contractor. Any reference in this document to the General Conditions of the Contract for Construction, AIA Document A201, or some abbreviated reference thereof, shall mean the AIA A201, 2007 Edition as modified by OSE Form 00811 – Standard Supplementary Conditions.

3.2 *Delete the language of Section 1.1.8 and substitute the word "Reserved."*

3.3 *Add the following Section 1.1.9:*

1.1.9 NOTICE TO PROCEED
Notice to Proceed is a document issued by the Owner to the Contractor, with a copy to the Architect, directing the Contractor to begin prosecution of the Work in accordance with the requirements of the Contract Documents. The Notice to Proceed shall fix the date on which the Contract Time will commence.

3.4 *Insert the following at the end of Section 1.2.1:*

In the event of patent ambiguities within or between parts of the Contract Documents, the contractor shall 1) provide the better quality or greater quantity of Work, or 2) comply with the more stringent requirement, either or both in accordance with the Architect's interpretation.

3.5 *Delete Section 1.5.1 and substitute the following:*

1.5.1 The Architect and the Architect's consultants shall be deemed the authors and owners of their respective Instruments of Service and will retain all common law, statutory and other reserved rights, including copyrights. The Contractor, Subcontractors, Sub-subcontractors, and material or equipment suppliers shall not own or claim a copyright in the Instruments of Service. Submittal or distribution to meet official regulatory requirements or for other purposes in connection with this Project is not to be construed as a violation of the Architect's or Architect's consultants' reserved rights.

3.6 *Delete Section 2.1.1 and substitute the following:*

2.1.1 The Owner is the person or entity identified as such in the Agreement and is referred to throughout the Contract Documents as if singular in number. The Owner shall designate in writing a representative who shall have express authority to bind the Owner with respect to all matters requiring the Owner's approval or authorization, except as provided in Section 7.1.2. Except as otherwise provided in Section 4.2.1, the Architect does not have such authority. The term "Owner" means the Owner or the Owner's Representative. [Reference § 8.2 of the Agreement.]

3.7 *Delete Section 2.1.2 and substitute the following:*

2.1.2 The Owner shall furnish to the Contractor within fifteen days after receipt of a written request, information necessary and relevant for the Contractor to post Notice of Project Commencement pursuant to Title 29, Chapter 5, Section 23 of the South Carolina Code of Laws, as amended..

3.8 *Delete Section 2.2.3 and substitute the following:*

2.2.3 The Owner shall furnish surveys describing physical characteristics, legal limitations and utility locations for the site of the Project, and a legal description of the site. Subject to the Contractor's obligations, including those in Section 3.2, the Contractor shall be entitled to rely on the accuracy of information furnished by the Owner pursuant to this Section but shall exercise proper precautions relating to the safe performance of the Work.

3.9 *Replace the period at the end of the last sentence of Section 2.2.4 with a semicolon and insert the following after the inserted semicolon:*

"however, the Owner does not warrant the accuracy of any such information requested by the Contractor that is not otherwise required of the Owner by the Contract Documents. Neither the Owner nor the Architect shall be required to conduct investigations or to furnish the Contractor with any information concerning subsurface characteristics or other conditions of the area where the Work is to be performed beyond that which is provide in the Contract Documents."

3.10 *Delete Section 2.2.5 and substitute the following:*

2.2.5 Unless otherwise provided in the Contract Documents, the Owner shall furnish to the Contractor with ten copies of the Contract Documents. The Contractor may make reproductions of the Contract Documents pursuant to Section 1.5.2. All copies of the drawings and specifications, except the Contractor's record set, shall be returned or suitably accounted for to the Owner, on request, upon completion of the Work.

3.11 *Add the following Sections 2.2.6 and 2.2.7:*

2.2.6 The Owner assumes no responsibility for any conclusions or interpretation made by the Contractor based on information made available by the Owner.

2.2.7 The Owner shall obtain, at its own cost, general building and specialty inspection services as required by the Contract Documents. The Contractor shall be responsible for payment of any charges imposed for reinspections.

3.12 *Delete Section 2.4 and substitute the following:*

2.4 If the Contractor defaults or neglects to carry out the Work in accordance with the Contract Documents and fails within a ten-day period after receipt of written notice from the Owner to commence and continue correction of such default or neglect, including but not limited to providing necessary resources, with diligence and promptness, the Owner may, without prejudice to other remedies the Owner may have, correct such deficiencies. In such case an appropriate Change Directive shall be issued deducting from payments then or thereafter due the Contractor the reasonable cost of correcting such deficiencies, including Owner's expenses and compensation for the Architect's additional services made necessary by such default, neglect or failure. If payments then or thereafter due the Contractor are not sufficient to cover such amounts, the Contractor shall pay the difference to the Owner.

3.13 *Insert the following at the end of Section 3.2.1:*

The Contractor acknowledges that it has investigated and satisfied itself as to the general and local conditions which can affect the work or its cost, including but not limited to (1) conditions bearing upon transportation, disposal, handling, and storage of materials; (2) the availability of labor, water, electric power, and roads; (3) uncertainties of weather, river stages, tides, or similar physical conditions at the site; (4) the conformation and conditions of the ground; and (5) the character of equipment and facilities needed preliminary to and during work performance. The Contractor also acknowledges that it has satisfied itself as to the character, quality, and quantity of surface and subsurface materials or obstacles to be encountered insofar as this information is reasonably ascertainable from an inspection of the site, including all exploratory work done by the Owner, as well as from the drawings and specifications made a part of this contract. Any failure of the Contractor to take the actions described and acknowledged in this paragraph will not relieve the Contractor from responsibility for estimating properly the difficulty and cost of successfully performing the work, or for proceeding to successfully perform the work without additional expense to the Owner.

3.14 *In the third sentence of Section 3.2.4, insert the word "latent" before the word "errors."*

3.15 *In the last sentence of Section 3.3.1, insert the words "by the Owner in writing" after the word "instructed."*

3.16 *Delete the third and fourth sentences of Section 3.5 and substitute the following sentences:*

Work, materials, or equipment not conforming to these requirements shall be considered defective. Unless caused by the Contractor or a subcontractor at any tier, the Contractor's warranty excludes remedy for damage or defect caused by abuse, alterations to the Work not executed by the Contractor, improper or insufficient maintenance, improper operation, or normal wear and tear and normal usage.

3.17 *Insert the following at the end of Section 3.6:*

The Contractor shall comply with the requirements of Title 12, Chapter 9 of the South Carolina Code of Laws, as amended, regarding withholding tax for nonresidents, employees, contractors and subcontractors.

3.18 *In Section 3.7.1, delete the words "the building permit as well as for other" and insert the following sentence at the end of this section:*

Pursuant to Title 10, Chapter 1, Section 180 of the South Carolina Code of Laws, as amended, no local general or specialty building permits are required for state buildings.

3.19 *Delete the last sentence of Section 3.7.5 and substitute the following:*

Adjustments in the Contract Sum and Contract Time arising from the existence of such remains or features may be made as provided in Article 7.3.3.

3.20 *Delete the last sentence of Section 3.8.2.3 and substitute the following:*

The amount of the Change Order shall reflect the difference between actual costs under Section 3.8.2.1, as documented by invoices, and the allowance amounts.

3.21 *In Section 3.9.1, insert a comma after the word "superintendent" in the first sentence and insert the following after the inserted comma:*

acceptable to the Owner,

3.22 *Delete Section 3.9.2 and substitute the following:*

3.9.2 The Contractor, as soon as practicable after award of the Contract, shall furnish in writing to the Owner the name and qualifications of a proposed superintendent. The Owner may reply within 14 days to the Contractor in writing stating (1) whether the Owner has reasonable objection to the proposed superintendent or (2) that the

Owner requires additional time to review. Failure of the Owner to reply within the 14-day period shall constitute notice of no reasonable objection.

3.23 *After the first sentence in Section 3.9.3, insert the following sentence:*

The Contractor shall notify the Owner, in writing, of any proposed change in the superintendent, including the reason therefore, prior to making such change.

3.24 *Delete Section 3.10.3 and substitute the following:*

3.10.3 Additional requirements, if any, for the constructions schedule are as follows:
(Check box if applicable to this Contract))

☒ The construction schedule shall be in a detailed precedence-style critical path management (CPM) or primavera-type format satisfactory to the Owner and the Architect that shall also (1) provide a graphic representation of all activities and events that will occur during performance of the work; (2) identify each phase of construction and occupancy; and (3) set forth dates that are critical in ensuring the timely and orderly completion of the Work in accordance with the requirements of the Contract Documents (hereinafter referred to as "Milestone Dates"). Upon review and acceptance by the Owner and the Architect of the Milestone Dates, the construction schedule shall be deemed part of the Contract Documents and attached to the Agreement as Exhibit "A." If not accepted, the construction schedule shall be promptly revised by the Contractor in accordance with the recommendations of the Owner and the Architect and resubmitted for acceptance. The Contactor shall monitor the progress of the Work for conformance with the requirements of the construction schedule and shall promptly advise the Owner of any delays or potential delays. Whenever the approved construction schedule no longer reflects actual conditions and progress of the work or the Contract Time is modified in accordance with the terms of the Contract Documents, the Contractor shall update the accepted construction schedule to reflect such conditions. In the event any progress report indicates any delays, the Contractor shall propose an affirmative plan to correct the delay, including overtime and/or additional labor, if necessary. In no event shall any progress report constitute an adjustment in the Contract Time, any Milestone Date, or the Contract Sum unless any such adjustment is agreed to by the Owner and authorized pursuant to Change Order.

3.25 *Add the following Section 3.10.4:*

3.10.4 Owner's review and acceptance of Contractor's schedule is not conducted for the purpose of either determining its accuracy and completeness or approving the construction means, methods, techniques, sequences or procedures. The Owner's approval shall not relieve the Contractor of any obligations. Unless expressly addressed in a Modification, the Owner's approval of a schedule shall not change the Contract Time.

3.26 *Add the following Section 3.12.5.1:*

3.12.5.1 The fire sprinkler shop drawings shall be prepared by a licensed fire sprinkler contractor and shall accurately reflect actual conditions affecting the required layout of the fire sprinkler system. The fire sprinkler contractor shall certify the accuracy of his shop drawings prior to submitting them for review and approval. The fire sprinkler shop drawings shall be reviewed and approved by the Architect's engineer of record who, upon approving the sprinkler shop drawings will submit them to the State Fire Marshal or other authorities having jurisdiction for review and approval. The Architect's engineer of record will submit a copy of the State Fire Marshal's approval letter to the Contractor, Architect, and OSE. Unless authorized in writing by OSE, neither the Contractor nor subcontractor at any tier shall submit the fire sprinkler shop drawings directly to the State Fire Marshal or other authorities having jurisdiction for approval.

3.27 *In the fourth sentence of Section 3.12.10, after the comma following the words "licensed design professional," insert the following:*

who shall comply with reasonable requirements of the Owner regarding qualifications and insurance and

3.28 *In Section 3.13, insert the section number "3.13.1" before the before the opening words "The Contractors shall."*

3.29 Add the following Sections 3.13.2 and 3.13.3:

3.13.2 Protection of construction materials and equipment stored at the Project site from weather, theft, vandalism, damage, and all other adversity is solely the responsibility of the Contractor. The Contractor shall perform the work in a manner that affords reasonable access, both vehicular and pedestrian, to the site of the Work and all adjacent areas. The Work shall be performed, to the fullest extent reasonably possible, in such a manner that public areas adjacent to the site of the Work shall be free from all debris, building materials, and equipment likely to cause hazardous conditions.

3.13.3 The Contractor and any entity for whom the Contractor is responsible shall not erect any sign on the Project site without the prior written consent of the Owner.

3.30 *In the first sentence of Section 3.18.1, after the parenthetical "...(other than the Work itself),..." and before the word "...but...", insert the following:*

including loss of use resulting therefrom,

3.31 *Delete Section 4.1.1 and substitute the following:*

4.1.1 The Architect is that person or entity identified as the Architect in the Agreement and is referred to throughout the Contract Documents as if singular in number.

3.32 *Insert the following at the end of Section 4.2.1:*

Any reference in the Contract Documents to the Architect taking action or rendering a decision with a "reasonable time" is understood to mean no more than fourteen days, unless otherwise specified in the Contract Documents or otherwise agreed to by the parties.

3.33 *Delete the first sentence of Section 4.2.2 and substitute the following:*

The Architect will visit the site as necessary to fulfill its obligation to the Owner for inspection services, if any, and, at a minimum, to assure conformance with the Architect's design as shown in the Contract Documents and to observe the progress and quality of the various components of the Contractor's Work, and to determine if the Work observed is being performed in a manner indicating that the Work, when fully completed, will be in accordance with the Contract Documents.

3.34 *Delete the first sentence of Section 4.2.3 and substitute the following*:

On the basis of the site visits, the Architect will keep the Owner informed about the progress and quality of the portion of the Work completed, and report to the Owner (1) deviations from the Contract Documents and from the most recent construction schedule submitted by the Contractor, and (2) defects and deficiencies observed in the Work.

3.35 *In Section 4.2.5, after the word "evaluations of the" and before the word "Contractor's," insert the following:*

Work completed and correlated with the

3.36 *Delete the first sentence of Section 4.2.11 and substitute the following:*

4.2.11 The Architect will, in the first instance, interpret and decide matters concerning performance under, and requirements of, the Contract Documents on written request of either the Owner or Contractor. Upon receipt of such request, the Architect will promptly provide the non-requesting party with a copy of the request.

3.37 *Insert the following at the end of Section 4.2.12:*

If either party disputes the Architects interpretation or decision, that party may proceed as provided in Article 15. The Architect's interpretations and decisions may be, but need not be, accorded any deference in any review conducted pursuant to law or the Contract Documents.

3.38 *Delete Section 4.2.14 and substitute the following:*

The Architect will review and respond to requests for information about the Contract Documents so as to avoid delay to the construction of the Project. The Architect's response to such requests will be made in writing with reasonable promptness. If appropriate, the Architect will prepare and issue supplemental Drawings and Specifications in response to the requests for information. Any response to a request for information must be consistent with the intent of, and reasonably inferable from, the Contract Documents and will be in writing or in the form of drawings. Unless issued pursuant to a Modification, supplemental Drawings or Specifications will not involve an adjustment to the Contract Sum or Contract Time.

3.39 *Delete Section 5.2.1 and substitute the following:*

5.2.1 Unless otherwise stated in the Contract Documents or the bidding requirements, the Contractor, within fourteen days after posting of the Notice of Intent to Award the Contract, shall furnish in writing to the Owner through the Architect the names of persons or entities (excluding Listed Subcontractors but including those who are to furnish materials or equipment fabricated to a special design) proposed for each principal portion of the Work. The Owner may reply within 14 days to the Contractor in writing stating (1) whether the Owner has reasonable objection to any such proposed person or entity. Failure of the Owner to reply within the 14 day period shall constitute notice of no reasonable objection.

3.40 *Delete Section 5.2.2 and substitute the following:*

5.2.2 The Contractor shall not contract with a proposed person or entity to whom the Owner has made reasonable and timely objection. The Owner shall not direct the Contractor to contract with any specific individual or entity for supplies or services unless such supplies and services are necessary for completion of the Work and the specified individual or entity is the only source of such supply or services.

3.41 *In the first sentence of Section 5.2.3, delete the words "...or Architect..." in the two places they appear.*

3.42 *Delete the words "...or Architect..." in the in the first sentence of Section 5.2.4 and insert the following sentence at the end of Section 5.2.4:*

The Contractor's request for substitution must be made to the Owner in writing accompanied by supporting information.

3.43 *Add the following Section 5.2.5:*

5.2.5 A Subcontractor identified in the Contractor's Bid in response the specialty subcontractor listing requirements of Section 7 of the Bid Form (SE-330) may only be substituted in accordance with and as permitted by the provisions of Title 11, Chapter 35, Section 3021 of the South Carolina Code of Laws, as amended. A proposed substitute for a Listed Subcontractor shall be subject to the Owner's approval as set forth is Section 5.2.3.

3.44 *In Section 5.3, delete everything following the heading "SUBCONTRACTUAL RELATIONS" and insert the following Sections 5.3.1, 5.3.2, 5.3.3, and 5.3.4:*

5.3.1 By appropriate written agreement, the Contractor shall require each Subcontractor, to the extent of the Work to be performed by the Subcontractor, to be bound to the Contractor by terms of the Contract Documents, and to assume toward the Contractor all the obligations and responsibilities, including the responsibility for safety of the Subcontractor's Work, which the Contractor, by these Documents, assumes toward the Owner and Architect. Each subcontract agreement shall preserve and protect the rights of the Owner and Architect under the Contract Documents with respect to the Work to be performed by the Subcontractor so that subcontracting thereof will not

prejudice such rights, and shall allow to the Subcontractor, unless specifically provided otherwise herein or in the subcontract agreement, the benefit of all rights, remedies and redress against the Contractor that the Contractor, by the Contract Documents, has against the Owner. Where appropriate, the Contractor shall require each Subcontractor to enter into similar agreements with Sub-subcontractors. The Contractor shall make available to each proposed Subcontractor, prior to the execution of the subcontract agreement, copies of the Contract Documents to which the Subcontractor will be bound, and, upon written request of the Subcontractor, identify to the Subcontractor terms and conditions of the proposed subcontract agreement that may be at variance with the Contract Documents. Subcontractors will similarly make copies of applicable portions of such documents available to their respective proposed Sub-subcontractors.

§ **5.3.2** Without limitation on the generality of Section 5.3.1, each Subcontract agreement and each Sub-subcontract agreement shall include, and shall be deemed to include, the following Sections of these General Conditions: 3.2, 3.5, 3.18, 5.3, 5.4, 6.2.2, 7.3.3, 7.5, 7.6, 13.1, 13.12, 14.3, 14.4, and 15.1.6.

§ **5.3.3** Each Subcontract Agreement and each Sub-subcontract agreement shall exclude, and shall be deemed to exclude, Sections 13.2.1 and 13.6 and all of Article 15, except Section 15.1.6, of these General Conditions. In the place of these excluded sections of the General Conditions, each Subcontract Agreement and each Sub-subcontract may include Sections 13.2.1 and 13.6 and all of Article 15, except Section 15.1.6, of AIA Document A201-2007, Conditions of the Contract, as originally issued by the American Institute of Architects.

§ **5.3.4** The Contractor shall assure the Owner that all agreements between the Contractor and its Subcontractor incorporate the provisions of Subparagraph 5.3.1 as necessary to preserve and protect the rights of the Owner and the Architect under the Contract Documents with respect to the work to be performed by Subcontractors so that the subcontracting thereof will not prejudice such rights. The Contractor's assurance shall be in the form of an affidavit or in such other form as the Owner may approve. Upon request, the Contractor shall provide the Owner or Architect with copies of any or all subcontracts or purchase orders.

3.45 *Delete the last sentence of Section 5.4.1.*

3.46 *Add the following Sections 5.4.4, 5.4.5 and 5.4.6:*

§ **5.4.4** Each subcontract shall specifically provide that the Owner shall only be responsible to the subcontractor for those obligations of the Contractor that accrue subsequent to the Owner's exercise of any rights under this conditional assignment.

§ **5.4.5** Each subcontract shall specifically provide that the Subcontractor agrees to perform portions of the Work assigned to the Owner in accordance with the Contract Documents.

§ **5.4.6** Nothing in this Section 5.4 shall act to reduce or discharge the Contractor's payment bond surety's obligations to claimants for claims arising prior to the Owner's exercise of any rights under this conditional assignment.

3.47 *Delete the language of Section 6.1.4 and substitute the word "Reserved."*

3.48 *Insert the following at the end of Section 7.1.2:*

If the amount of a Modification exceeds the limits of the Owner's Construction Change Order Certification (reference Section 9.1.7.2 of the Agreement), then the Owner's agreement is not effective, and Work may not proceed, until approved in writing by the Office of State Engineer.

3.49 *Delete Section 7.2.1 and substitute the following:*

7.2.1 A Change Order is a written instrument prepared by the Architect (using State Form SE-480 "Construction Change Order") and signed by the Owner, Contractor and Architect stating their agreement upon all of the following:

.1 The change in the Work;

.2 The amount of the adjustment, if any, in the Contract Sum; and
.3 The extent of the adjustment, if any, in the Contract Time.

3.50 *Add the following Sections 7.2.2, 7.2.3, 7.2.4, and 7.2.5:*

7.2.2 If a Change Order provides for an adjustment to the Contract Sum, the adjustment must be calculated in accordance with Section 7.3.3.

7.2.3 At the Owner's request, the Contractor shall prepare a proposal to perform the work of a proposed Change Order setting forth the amount of the proposed adjustment, if any, in the Contract Sum; and the extent of the proposed adjustment, if any, in the Contract Time. Any proposed adjustment in the Contract sum shall be prepared in accordance with Section 7.2.2. The Owner's request shall include any revisions to the Drawings or Specifications necessary to define any changes in the Work. Within fifteen days of receiving the request, the Contractor shall submit the proposal to the Owner and Architect along with all documentation required by Section 7.6.

7.2.4 If the Contractor requests a Change Order, the request shall set forth the proposed change in the Work and shall be prepared in accordance with Section 7.2.3. If the Contractor requests a change to the Work that involves a revision to either the Drawings or Specifications, the Contractor shall reimburse the Owner for any expenditures associated with the Architects' review of the proposed revisions, except to the extent the revisions are accepted by execution of a Change Order.

7.2.5 Agreement on any Change Order shall constitute a final settlement of all matters relating to the change in the Work that is the subject of the Change Order, including, but not limited to, any adjustments to the Contract Sum or the Contract Time.

3.51 *Delete 7.3.3 and substitute the following:*

7.3.3 PRICE ADJUSTMENTS
§ 7.3.3.1 If any Modification, including a Construction Change Directive, provides for an adjustment to the Contract Sum, the adjustment shall be based on whichever of the following methods is the most valid approximation of the actual cost to the contractor, with overhead and profit as allowed by Section 7.5:

.1 Mutual acceptance of a lump sum;
.2 Unit prices stated in the Contract Documents, except as provided in Section 7.3.4, or subsequently agreed upon;
.3 Cost attributable to the events or situations under applicable clauses with adjustment of profits or fee, all as specified in the contract, or subsequently agreed upon by the parties, or by some other method as the parties may agree; or
.4 As provided in Section 7.3.7.

§ 7.3.3.2 Consistent with Section 7.6, costs must be properly itemized and supported by substantiating data sufficient to permit evaluation before commencement of the pertinent performance or as soon after that as practicable. All costs incurred by the Contractor must be justifiably compared with prevailing industry standards. Except as provided in Section 7.5, all adjustments to the Contract Price shall be limited to job specific costs and shall not include indirect costs, overhead, home office overhead, or profit.

3.52 *Delete Section 7.3.7 and substitute the following:*

7.3.7 If the Contractor does not respond promptly or disagrees with the method for adjustment in the Contract Sum, the Architect shall make an initial determination, consistent with Section 7.3.3, of the method and the adjustment on the basis of reasonable expenditures and savings of those performing the Work attributable to the change, including, in case of an increase in the Contract Sum, an amount for overhead and profit as set forth in Section 7.5. In such case, and also under Section 7.3.3.1.3, the Contractor shall keep and present, in such form as the Architect may prescribe, an itemized accounting together with appropriate supporting data. Unless otherwise provided in the Contract Documents, costs for the purposes of this Section 7.3.7 shall be limited to the following:

.1 Costs of labor, including social security, old age and unemployment insurance, fringe benefits required by agreement or custom, and workers' compensation insurance;

.2 Costs of materials, supplies and equipment, including cost of transportation, whether incorporated or consumed;

.3 Rental costs of machinery and equipment, exclusive of hand tools, whether rented from the Contractor or others; and

.4 Costs of premiums for all bonds and insurance, permit fees, and sales, use or similar taxes related to the Work.

3.53 *Delete Section 7.3.8 and substitute the following:*

7.3.8 Using the percentages stated in Section 7.5, any adjustment to the Contract Sum for deleted work shall include any overhead and profit attributable to the cost for the deleted Work.

3.54 *Add the following Sections 7.5 and 7.6:*

7.5 AGREED OVERHEAD AND PROFIT RATES

7.5.1 For any adjustment to the Contract Sum for which overhead and profit may be recovered, other than those made pursuant to Unit Prices stated in the Contract Documents, the Contractor agrees to charge and accept, as full payment for overhead and profit, the following percentages of costs attributable to the change in the Work. The percentages cited below shall be considered to include all indirect costs including, but not limited to: field and office managers, supervisors and assistants, incidental job burdens, small tools, and general overhead allocations. The allowable percentages for overhead and profit are as follows:

.1 To the Contractor for work performed by the Contractor's own forces, 17% of the Contractor's actual costs.

.2 To each Subcontractor for work performed by the Subcontractor's own forces, 17% of the subcontractor's actual costs.

.3 To the Contractor for work performed by a subcontractor, 10% of the subcontractor's actual costs (not including the subcontractor's overhead and profit).

7.6 PRICING DATA AND AUDIT

§ 7.6.1 Cost or Pricing Data.

Upon request of the Owner or Architect, Contractor shall submit cost or pricing data prior to execution of a Modification which exceeds $500,000. Contractor shall certify that, to the best of its knowledge and belief, the cost or pricing data submitted is accurate, complete, and current as of a mutually determined specified date prior to the date of pricing the Modification. Contractor's price, including profit, shall be adjusted to exclude any significant sums by which such price was increased because Contractor furnished cost or pricing data that was inaccurate, incomplete, or not current as of the date specified by the parties. Notwithstanding Subparagraph 9.10.4, such adjustments may be made after final payment to the Contractor.

§ 7.6.2 Cost or pricing data means all facts that, as of the date specified by the parties, prudent buyers and sellers would reasonably expect to affect price negotiations significantly. Cost or pricing data are factual, not judgmental; and are verifiable. While they do not indicate the accuracy of the prospective contractor's judgment about estimated future costs or projections, they do include the data forming the basis for that judgment. Cost or pricing data are more than historical accounting data; they are all the facts that can be reasonably expected to contribute to the soundness of estimates of future costs and to the validity of determinations of costs already incurred.

§ 7.6.3 Records Retention.

As used in Section 7.6, the term "records" means any books or records that relate to cost or pricing data that Contractor is required to submit pursuant to Section 7.6.1. Contractor shall maintain records for three years from the date of final payment, or longer if requested by the chief procurement officer. The Owner may audit Contractor's records at reasonable times and places.

3.55 Delete Section 8.2.2 and substitute the following:

8.2.2 The Contractor shall not knowingly commence operations on the site or elsewhere prior to the effective date of surety bonds and insurance required by Article 11 to be furnished by the Contractor and Owner. The date of commencement of the Work shall not be changed by the effective date of such surety bonds or insurance.

3.56 *Delete Section 8.3.1 and substitute the following:*

8.3.1 If the Contractor is delayed at any time in the commencement or progress of the Work by an act or neglect of the Owner or Architect, or of an employee of either, or of a separate contractor employed by the Owner; or by changes ordered in the Work; or by labor disputes, fire, unusual delay in deliveries, unavoidable casualties or other causes beyond the control of the Contractor and any subcontractor at any tier; or by delay authorized by the Owner pending dispute resolution; or by other causes that the Architect determines may justify delay, then to the extent such delay will prevent the Contractor from achieving Substantial Completion within the Contract Time and provided the delay (1) is not caused by the fault or negligence of the Contractor or a subcontractor at any tier and (2) is not due to unusual delay in the delivery of supplies, machinery, equipment, or services when such supplies, machinery, equipment, or services were obtainable from other sources in sufficient time for the Contractor to meet the required delivery, the Contract Time shall be extended by Change Order for such reasonable time as the Architect may determine.

3.57 *Insert the following at the end of Section 9.1:*

All changes to the Contract Sum shall be adjusted in accordance with Section 7.3.3.

3.58 *Delete Section 9.2 and substitute the following:*

9.2 SCHEDULE OF VALUES

9.2.1 The Contractor shall submit to the Architect, within ten days of full execution of the Agreement, a schedule of values allocating the entire Contract Sum to the various portions of the Work and prepared in such form and supported by such data to substantiate its accuracy as the Architect may require. This schedule, unless objected to by the Architect, shall be used as a basis for reviewing the Contractor's Applications for Payment. As requested by the Architect, the Contractor and each Subcontractor shall prepare a trade payment breakdown for the Work for which each is responsible, such breakdown being submitted on a uniform standardized format approved by the Architect and Owner. The breakdown shall be divided in detail, using convenient units, sufficient to accurately determine the value of completed Work during the course of the Project. The Contractor shall update the schedule of values as required by either the Architect or Owner as necessary to reflect:

- **.1** the description of Work (listing labor and material separately);
- **.2** the total value;
- **.3** the percent and value of the Work completed to date;
- **.4** the percent and value of previous amounts billed; and
- **.5** the current percent completed and amount billed.

9.2.2 Any schedule of values or trade breakdown that fails to include sufficient detail, is unbalanced, or exhibits "front-loading" of the value of the Work shall be rejected. If a schedule of values or trade breakdown is used as the basis for payment and later determined to be inaccurate, sufficient funds shall be withheld from future Applications for Payment to ensure an adequate reserve (exclusive of normal retainage) to complete the Work.

3.59 *Delete Section 9.3.1 and substitute the following:*

Monthly, the Contractor shall submit to the Architect an itemized Application for Payment prepared in accordance with the schedule of values, if required under Section 9.2., for completed portions of the Work. Such application shall be notarized, if required, and supported by such data substantiating the Contractor's right to payment as the Owner or Architect may require (such as copies of requisitions from Subcontractors and material suppliers) and shall reflect retainage and any other adjustments provided in Section 5 of the Agreement. If required by the Owner or Architect, the Application for Payment shall be accompanied by a current construction schedule.

3.60 In Section 9.3.2, add the following words to the end of the second sentence:

provided such materials or equipment will be subsequently incorporated in the Work

Insert the following at the end of Section 9.3.2:

The Contractor shall 1) protect such materials from diversion, vandalism, theft, destruction, and damage, 2) mark such materials specifically for use on the Project, and 3) segregate such materials from other materials at the storage facility. The Architect and the Owner shall have the right to make inspections of the storage areas at any time.

3.61 *In Section 9.4.2, in the first sentence, after the words "Work has progressed to the point indicated," insert the following:*

in both the Application for Payment and, if required to be submitted by the Contractor, the accompanying current construction schedule

In the last sentence, delete the third item starting with "(3) reviewed copies" and ending with "Contractor's right to payment,"

3.62 *In Section 9.5.1, in the first sentence, delete the word "may" after the opening words "The Architect" and substitute the word "shall."*

In Section 9.5.1, insert the following sentence after the first sentence:

The Architect shall withhold a Certificate of Payment if the Application for Payment is not accompanied by the current construction schedule required by Section 3.10.1.

3.63 *In Section 9.6.2, delete the word "The..." at the beginning of the first sentence and substitute the following:*

Pursuant to Chapter 6 of Title 29 of the South Carolina Code of Laws, as amended, the

3.64 *Delete Section 9.7 and substitute following:*

9.7 FAILURE OF PAYMENT
If the Architect does not issue a Certificate for Payment to the Owner, through no fault of the Contractor, within seven days after receipt of the Contractor's Application for Payment, or if the Owner does not pay the Contractor within seven days after the time established in the Contract Documents the amount certified by the Architect or awarded by a final dispute resolution order, then the Contractor may, upon seven additional days' written notice to the Owner and Architect, stop the Work until payment of the amount owing has been received. The Contract Time shall be extended appropriately and the Contract Sum shall be increased, in accordance with the provisions of Section 7.3.3, by the amount of the Contractor's reasonable costs of shut-down, delay and start-up, plus interest as provided for in the Contract Documents.

3.65 *Insert the following words at the end of the sentence in Section 9.8.1:*

and when all required occupancy permits, if any, have been issued and copies of same have been delivered to the Owner.

3.66 *In Section 9.8.2, insert the word "written" after the word "comprehensive" and before the word "list."*

3.67 *Delete Section 9.8.3 and substitute the following:*

9.8.3.1 Upon receipt of the Contractor's list, the Architect, with the Owner and any other person the Architect or the Owner choose, will make an inspection on a date and at a time mutually agreeable to the Architect, Owner, and Contractor, to determine whether the Work or designated portion thereof is substantially complete. The Contractor shall furnish access for the inspection and testing as provided in this Contract. The inspection shall include a

demonstration by the Contractor that all equipment, systems and operable components of the Work function properly and in accordance with the Contract Documents. If the Architect's inspection discloses any item, whether or not included on the Contractor's list, which is not sufficiently complete in accordance with the Contract Documents so that the Owner can occupy or utilize the Work or designated portion thereof for its intended use, the Contractor shall, before issuance of the Certificate of Substantial Completion, complete or correct such item upon notification by the Architect. In such case, the Contractor shall then submit a request for another inspection by the Architect to determine Substantial Completion. If more than one Substantial Completion inspection is required, the Contractor shall reimburse the Owner for all costs of reinspections or, at the Owner's option, the costs may be deducted from payments due to the Contractor.

9.8.3.2 If the Architect and Owner concur in the Contractor's assessment that the Work or a portion of the Work is safe to occupy, the Owner and Contractor may arrange for a Certificate of Occupancy Inspection by OSE. The Owner, Architect, and Contractor shall be present at OSE's inspection. Upon verifying that the Work or a portion of the Work is substantially complete and safe to occupy, OSE will issue, as appropriate, a Full or Partial Certificate of Occupancy.

3.68 *In the second sentence of Section 9.8.5, delete the words "and consent of surety, if any."*

3.69 *In the first sentence of Section 9.9.1, delete the words "Section 11.3.1.5" and substitute the words "Section 11.3.1.3."*

3.70 *Delete Section 9.10.1 and substitute the following:*

9.10.1 Unless the parties agree otherwise in the Certificate of Substantial Completion, the Contractor shall achieve Final Completion no later than thirty days after Substantial Completion. Upon receipt of the Contractor's written notice that the Work is ready for final inspection and acceptance and upon receipt of a final Application for Payment, the Architect, with the Owner and any other person the Architect or the Owner choose, will make an inspection on a date and at a time mutually agreeable to the Architect, Owner, and Contractor, and, when the Architect finds the Work acceptable under the Contract Documents and the Contract fully performed, the Architect will promptly issue a final Certificate for Payment stating that to the best of the Architect's knowledge, information and belief, and on the basis of the Architect's on-site visits and inspections, the Work has been completed in accordance with terms and conditions of the Contract Documents and that the entire balance found to be due the Contractor and noted in the final Certificate is due and payable. The Architect's final Certificate for Payment will constitute a further representation that conditions listed in Section 9.10.2 as precedent to the Contractor's being entitled to final payment have been fulfilled. If more than one Final Completion inspection is required, the Contractor shall reimburse the Owner for all costs of reinspections or, at the Owner's option, the costs may be deducted from payments due to the Contractor. If the Contractor does not achieve final completion within thirty days after Substantial Completion or the timeframe agreed to by the parties in the Certificate of Substantial Completion, whichever is greater, the Contractor shall be responsible for any additional Architectural fees resulting from the delay.

3.71 *Delete the first sentence of Section 9.10.2 and substitute the following:*

Neither final payment nor any remaining retained percentage shall become due until the Contractor submits to the Architect (1) an affidavit that payrolls, bills for materials and equipment, and other indebtedness connected with the Work for which the Owner or the Owner's property might be responsible or encumbered (less amounts withheld by Owner) have been paid or otherwise satisfied, (2) a certificate evidencing that insurance required by the Contract Documents to remain in force after final payment is currently in effect and will not be canceled or allowed to expire until at least 30 days' prior written notice has been given to the Owner, (3) a written statement that the Contractor knows of no substantial reason that the insurance will not be renewable to cover the period required by the Contract Documents, (4) consent of surety, if any, to final payment (5), if required by the Owner, other data establishing payment or satisfaction of obligations, such as receipts, releases and waivers of liens, claims, security interests or encumbrances arising out of the Contract, to the extent and in such form as may be designated by the Owner, (6) required Training Manuals, (7) equipment Operations and Maintenance Manuals, (8) any certificates of testing, inspection or approval required by the Contract Documents and not previously provided (9) all warranties and guarantees required under or pursuant to the Contract Documents, and (10) one copy of the Documents required by Section 3.11.

3.72 Delete the first sentence of Section 9.10.3 and substitute the following:

If, after Substantial Completion of the Work, final completion thereof is delayed 60 days through no fault of the Contractor or by issuance of Change Orders affecting final completion, and the Architect so confirms, the Owner shall, upon application by the Contractor and certification by the Architect, and without terminating the Contract, make payment of the balance due for that portion of the Work fully completed and accepted.

3.73 *Delete Section 9.10.5 and substitute the following:*

§9.10.5 Acceptance of final payment by the Contractor, a Subcontractor or material supplier shall constitute a waiver of claims by that payee except those specific claims in stated amounts that have been previously made in writing and identified by that payee as unsettled at the time of final Application for Payment.

3.74 Add the following Section 9.10.6:

9.10.6 If OSE has not previously issued a Certificate of Occupancy for the entire Project, the Parties shall arrange for a representative of OSE to participate in the Final Completion Inspection. Representatives of the State Fire Marshal's Office and other authorities having jurisdiction may be present at the Final Completion Inspection or otherwise inspect the completed Work and advise the Owner whether the Work meets their respective requirements for the Project.

3.75 *Delete Section 10.3.1 and substitute the following:*

10.3.1 If the Contractor encounters a hazardous material or substance which was not discoverable as provided in Section 3.2.1 and not required by the Contract Documents, and if reasonable precautions will be inadequate to prevent foreseeable bodily injury or death to persons or serious loss to real or personal property resulting from such material or substance encountered on the site by the Contractor, the Contractor shall, upon recognizing the condition, immediately stop Work in the affected area and report the condition to the Owner and Architect in writing. Hazardous materials or substances are those hazardous, toxic, or radioactive materials or substances subject to regulations by applicable governmental authorities having jurisdiction, such as, but not limited to, the S.C. Department of Health and Environmental Control, the U.S. Environmental Protection Agency, and the U.S. Nuclear Regulatory Commission.

3.76 *Insert the following at the end of Section 10.3.2:*

In the absence of agreement, the Architect will make an interim determination regarding any delay or impact on the Contractor's additional costs. The Architect's interim determination of cost shall adjust the Contract Sum on the same basis as a Change Order, subject to the right of either party to disagree and assert a Claim in accordance with Article 15. Any adjustment in the Contract Sum shall be determined in accordance with Section 7.3.3.

3.77 *Delete Section 10.3.3 and substitute the following:*

10.3.3 The Work in the affected area shall be resumed immediately following the occurrence of any one of the following events: (a) the Owner causes remedial work to be performed that results in the absence of hazardous materials or substances; (b) the Owner and the Contractor, by written agreement, decide to resume performance of the Work; or (c) the Work may safely and lawfully proceed, as determined by an appropriate governmental authority or as evidenced by a written report to both the Owner and the Contractor, which is prepared by an environmental engineer reasonably satisfactory to both the Owner and the Contractor.

3.78 *In Section 10.3.5, delete the word "The" at the beginning of the sentence and substitute the following:*

In addition to its obligations under Section 3.18, the

3.79 *Delete the language of Section 10.3.6 and substitute the word "Reserved."*

3.80 *Insert the following at the end of Section 10.4:*

The Contractor shall immediately give the Architect notice of the emergency. This initial notice may be oral followed within five days by a written notice setting forth the nature and scope of the emergency. Within fourteen days of the start of the emergency, the Contractor shall give the Architect a written estimate of the cost and probable effect of delay on the progress of the Work.

3.81 *Delete 11.1.2 and substitute the following:*

11.1.2 The insurance required by Section 11.1.1 shall be written for not less than limits of liability specified below or required by law, whichever coverage is greater. Coverages shall be written on an occurrence basis and shall be maintained without interruption from the date of commencement of the Work until the date of final payment and termination of any coverage required to be maintained after final payment, and, with respect to the Contractor's completed operations coverage, until the expiration of the period for correction of Work or for such other period for maintenance of completed operations coverage as specified in the Contract Documents.

(1) COMMERCIAL GENERAL LIABILITY:
- (a) General Aggregate (per project) $1,000,000
- (b) Products/Completed Operations $1,000,000
- (c) Personal and Advertising Injury $1,000,000
- (d) Each Occurrence $1,000,000
- (e) Fire Damage (Any one fire) $50,000
- (f) Medical Expense (Any one person) $5,000

(2) BUSINESS AUTO LIABILITY (including All Owned, Non-owned, and Hired Vehicles):
- (a) Combined Single Limit $1,000,000

(3) WORKER'S COMPENSATION:
- (a) State Statutory
- (b) Employers Liability ..... $100,000 Per Acc.
  ..... $500,000 Disease, Policy Limit
  ..... $100,000 Disease, Each Employee

In lieu of separate insurance policies for Commercial General Liability, Business Auto Liability, and Employers Liability, the Contractor may provide an umbrella policy meeting or exceeding all coverage requirements set forth in this Section 11.1.2. The umbrella policy limits shall not be less than $3,000,000.

3.82 *Delete Section 11.1.3 and substitute the following:*

11.1.3 Prior to commencement of the Work, and thereafter upon replacement of each required policy of insurance, Contractor shall provide to the Owner a written endorsement to the Contractor's general liability insurance policy that:

(i) names the Owner as an additional insureds for claims caused in whole or in part by the Contractor's negligent acts or omissions during the Contractor's operations;
(ii) provides that no material alteration, cancellation, non-renewal, or expiration of the coverage contained in such policy shall have effect unless all additional insureds have been given at least ten (10) days prior written notice of cancellation for non-payment of premiums and thirty (30) days prior written notice of cancellation for any other reason; and
(iii) provides that the Contractor's liability insurance policy shall be primary, with any liability insurance of the Owner as secondary and noncontributory.

Prior to commencement of the Work, and thereafter upon renewal or replacement of each required policy of insurance, Contractor shall provide to the Owner a signed, original certificate of liability insurance (ACORD 25). Consistent with this Section 11.1, the certificate shall identify the types of insurance, state the limits of liability for each type of coverage, name the Owner a Consultants as Certificate Holder, provide that the general aggregate limit applies per project, and provide that coverage is written on an occurrence basis. Both the certificates and the

endorsements must be received directly from either the Contractor's insurance agent or the insurance company. An additional certificate evidencing continuation of liability coverage, including coverage for completed operations, naming the Owner as an additional insured for claims made under the Contractor's completed operations, and otherwise meeting the above requirements, shall be submitted with the final Application for Payment as required by Section 9.10.2 and thereafter upon renewal or replacement of such coverage until the expiration of the time required by Section 11.1.2. Information concerning reduction of coverage on account of revised limits or claims paid under the General Aggregate, or both, shall be furnished by the Contractor with reasonable promptness.

3.83 *Delete Section 11.1.4 and substitute the following:*
11.1.4 A failure by the Owner either (i) to demand a certificate of insurance or written endorsement required by Section 11.1, or (ii) to reject a certificate or endorsement on the grounds that it fails to comply with Section 11.1 shall not be considered a waiver of Contractor's obligations to obtain the required insurance.

3.84 *In Section 11.3.1, delete the first sentence and substitute the following:*

Unless otherwise provided in the Contract Documents, the Contractor shall purchase and maintain, in a company or companies lawfully authorized to do business in the jurisdiction in which the Project is located, property insurance written on a builder's risk "all-risk" or equivalent policy form in the amount of the initial Contract Sum, plus value of subsequent Contract Modifications and cost of materials supplied or installed by others, comprising total value for the entire Project at the site on a replacement cost basis.

3.85 *Delete the language of Section 11.3.1.2 and substitute the word "Reserved."*

3.86 *Delete the language of Section 11.3.1.3 and substitute the word "Reserved."*

3.87 *Delete Section 11.3.2 and substitute the following:*

11.3.2 BOILER AND MACHINERY INSURANCE
The Contractor shall purchase and maintain boiler and machinery insurance required by the Contract Documents or by law, which shall specifically cover such insured objects during installation and until final acceptance by the Owner; this insurance shall include interests of the Owner, Contractor, Subcontractors and Sub-subcontractors in the Work, and the Owner and Contractor shall both be named insureds.

3.88 *Delete Section 11.3.3 and substitute the following:*

11.3.3 LOSS OF USE INSURANCE
The Owner, at the Owner's option, may purchase and maintain such insurance as will insure the Owner against loss of use of the Owner's property due to fire or other hazards, however caused. To the extent any losses are covered and paid for by such insurance, the Owner waives all rights of action against the Contractor for loss of use of the Owner's property, including consequential losses due to fire or other hazards however caused.

3.89 *Delete Section 11.3.4 and substitute the following:*

11.3.4 If the Owner requests in writing that insurance for risks other than those described herein or other special causes of loss be included in the property insurance policy, the Contractor shall, if possible, include such insurance, and the cost thereof shall be charged to the Owner by appropriate Change Order.

3.90 *Delete the language of Section 11.3.5 and substitute the word "Reserved."*

3.91 *Delete Section 11.3.6 and substitute the following:*

11.3.6 Before an exposure to loss may occur, the Contractor shall file with the Owner a copy of each policy that includes insurance coverages required by this Section 11.3. Each policy shall contain all generally applicable conditions, definitions, exclusions and endorsements related to this Project. Each policy shall contain a provision that the policy will not be canceled or allowed to expire, and that its limits will not be reduced, until at least 30 days' prior written notice has been given to the Owner.

3.92 Delete the first sentence of Section 11.3.7 and substitute the following:

The Owner and Contractor waive all rights against (1) each other and any of their subcontractors, sub-subcontractors, agents and employees, each of the other, and (2) the Architect, Architect's consultants, separate contractors described in Article 6, if any, and any of their subcontractors, sub-subcontractors, agents and employees, for damages caused by fire or other causes of loss to the extent the property insurance provided by the Contractor pursuant to this Section 11.3 covers and pays for the damage, except such rights as they have to proceeds of such insurance held by the Contractor as fiduciary.

3.93 *Delete the first sentence of Section 11.3.8 and substitute the following:*

A loss insured under the Contractor's property insurance shall be adjusted by the Contractor as fiduciary and made payable to the Contractor as fiduciary for the insureds, as their interests may appear, subject to requirements of any applicable mortgagee clause and of Section 11.3.10.

3.94 *Delete Section 11.3.9 and substitute the following:*

11.3.9 If required in writing by a party in interest, the Contractor as fiduciary shall, upon occurrence of an insured loss, give bond for proper performance of the Contractor's duties. The cost of required bonds shall be charged against proceeds received as fiduciary. The Contractor shall deposit in a separate account proceeds so received, which the Contractor shall distribute in accordance with such agreement as the parties in interest may reach. If after such loss no other special agreement is made and unless the Owner terminates the Contract for convenience, replacement of damaged property shall be performed by the Contractor.

3.95 *Delete Section 11.3.10 and substitute the following:*

11.3.10 The Contractor as fiduciary shall have power to adjust and settle a loss with insurers unless one of the parties in interest shall object in writing within five days after occurrence of loss to the Contractor's exercise of this power; if such objection is made, the dispute shall be resolved in the manner provided in the contract between the parties in dispute as the method of binding dispute resolution. The Contractor as fiduciary shall make settlement with insurers or, in the case of a dispute over distribution of insurance proceeds, in accordance with a final order or determination issued by the appropriate authority having jurisdiction over the dispute..

3.96 *Delete Section 11.4.1 and substitute the following:*

11.4.1 Before commencing any services hereunder, the Contractor shall provide the Owner with Performance and Payment Bonds, each in an amount not less than the Contract Price set forth in Article 4 of the Agreement. The Surety shall have, at a minimum, a "Best Rating" of "A" as stated in the most current publication of "Best's Key Rating Guide, Property-Casualty". In addition, the Surety shall have a minimum "Best Financial Strength Category" of "Class V", and in no case less than five (5) times the contract amount. The Performance Bond shall be written on Form SE-355, "Performance Bond" and the Payment Bond shall written on Form SE-357, "Labor and Material Payment Bond", and both shall be made payable to the Owner.

3.97 *Delete Section 11.4.2 and substitute the following:*

11.4.2 The Performance and Labor and Material Payment Bonds shall:

- **.1** be issued by a surety company licensed to do business in South Carolina;
- **.2** be accompanied by a current power of attorney and certified by the attorney-in-fact who executes the bond on the behalf of the surety company; and
- **.3** remain in effect for a period not less than one (1) year following the date of Substantial Completion or the time required to resolve any items of incomplete Work and the payment of any disputed amounts, whichever time period is longer.

3.98 *Add the following Sections 11.4.3 and 11.4.4:*

11.4.3 Any bonds required by this Contract shall meet the requirements of the South Carolina Code of Laws and Regulations, as amended.

11.4.4 Upon the request of any person or entity appearing to be a potential beneficiary of bonds covering payment of obligations arising under the Contract, the Contractor shall promptly furnish a copy of the bonds or shall authorize a copy to be furnished.

3.99 *Delete Section 12.1.1 and substitute the following:*

12.1.1 If a portion of the Work is covered contrary to the to requirements specifically expressed in the Contract Documents, including inspections of work-in-progress required by all authorities having jurisdiction over the Project, it must, upon demand of the Architect or authority having jurisdiction, be uncovered for observation and be replaced at the Contractor's expense without change in the Contract Time.

3.100 *In Section 12.2.2.1, delete the words "and to make a claim for breach of warranty" at the end of the third sentence.*

3.101 *In Section 12.2.2.3, add the following to the end of the sentence:*

unless otherwise provided in the Contract Documents.

3.102 *Insert the following at the end of Section 12.2.4:*

If, prior to the date of Substantial Completion, the Contractor, a Subcontractor, or anyone for whom either is responsible, uses or damages any portion of the Work, including, without limitation, mechanical, electrical, plumbing, and other building systems, machinery, equipment, or other mechanical device, the Contractor shall cause such item to be restored to "like new" condition at no expense to the Owner.

3.103 *Delete Section 13.1 and substitute the following:*

13.1 GOVERNING LAW
The Contract, any dispute, claim, or controversy relating to the Contract, and all the rights and obligations of the parties shall, in all respects, be interpreted, construed, enforced and governed by and under the laws of the State of South Carolina, except its choice of law rules.

3.104 *Delete Section 13.2, including its Sub-Sections 13.2.1 and 13.2.2, and substitute the following:*

13.2 SUCCESSORS AND ASSIGNS
The Owner and Contractor respectively bind themselves, their partners, successors, assigns and legal representatives to covenants, agreements and obligations contained in the Contract Documents. Neither party to the Contract shall assign the Contract as a whole, or in part, without written consent of the other and then only in accordance with and as permitted by Regulation 19-445.2180 of the South Carolina Code of Regulations, as amended. If either party attempts to make such an assignment without such consent, that party shall nevertheless remain legally responsible for all obligations under the Contract.

3.105 *Delete Section 13.3 and substitute the following:*

13.3 WRITTEN NOTICE
Unless otherwise permitted herein, all notices contemplated by the Contract Documents shall be in writing and shall be deemed given:

- **.1** upon actual delivery, if delivery is by hand;
- **.2** upon receipt by the transmitting party of confirmation or reply, if delivery is by electronic mail, facsimile, telex or telegram;
- **.3** upon receipt, if delivery is by the United States mail.

Notice to Contractor shall be to the address provided in Section 8.3.2 of the Agreement. Notice to Owner shall be to the address provided in Section 8.2.2 of the Agreement. Either party may designate a different address for notice by giving notice in accordance with this paragraph.

3.106 *In Section 13.4.1, insert the following at the beginning of the sentence:*

Unless expressly provided otherwise,

3.107 *Add the following Section 13.4.3:*

13.4.3 Notwithstanding Section 9.10.4, the rights and obligations which, by their nature, would continue beyond the termination, cancellation, rejection, or expiration of this contract shall survive such termination, cancellation, rejection, or expiration, including, but not limited to, the rights and obligations created by the following clauses:

1.5 Ownership and Use of Drawings, Specifications and Other Instruments of Service;
3.5 Warranty
3.17 Royalties, Patents and Copyrights
3.18 Indemnification
7.6 Cost or Pricing Data
11.1 Contractor's Liability Insurance
11.4 Performance and Payment Bond
15.1.6 Claims for Listed Damages
15.1.7 Waiver of Claims Against the Architect
15.6 Dispute Resolution
15.4 Service of Process

3.108 *Delete Section 13.6 and substitute the following:*

13.6 INTEREST
Payments due to the Contractor and unpaid under the Contract Documents shall bear interest only if and to the extent allowed by Title 29, Chapter 6, Article 1 of the South Carolina Code of Laws. . Amounts due to the Owner shall bear interest at the rate of one percent a month or a pro rata fraction thereof on the unpaid balance as may be due.

3.109 *Delete the language of Section 13.7 and substitute the word "Reserved."*

3.110 *Add the following Sections 13.8 through 13.16:*

13.8 PROCUREMENT OF MATERIALS BY OWNER
The Contractor accepts assignment of all purchase orders and other agreements for procurement of materials and equipment by the Owner that are identified as part of the Contract Documents. The Contractor shall, upon delivery, be responsible for the storage, protection, proper installation, and preservation of such Owner purchased items, if any, as if the Contractor were the original purchaser. The Contract Sum includes, without limitation, all costs and expenses in connection with delivery, storage, insurance, installation, and testing of items covered in any assigned purchase orders or agreements. Unless the Contract Documents specifically provide otherwise, all Contractor warranty of workmanship and correction of the Work obligations under the Contract Documents shall apply to the Contractor's installation of and modifications to any Owner purchased items,.

13.9 INTERPRETATION OF BUILDING CODES
As required by Title 10, Chapter 1, Section 180 of the South Caroline Code of Laws, as amended, OSE shall determine the enforcement and interpretation of all building codes and referenced standards on state buildings. The Contractor shall refer any questions, comments, or directives from local officials to the Owner and OSE for resolution.

13.10 MINORITY BUSINESS ENTERPRISES
Contractor shall notify Owner of each Minority Business Enterprise (MBE) providing labor, materials, equipment, or supplies to the Project under a contract with the Contractor. Contractor's notification shall be via the first monthly status report submitted to the Owner after execution of the contract with the MBE. For each such MBE, the Contractor shall provide the MBE's name, address, and telephone number, the nature of the work to be performed or materials or equipment to be supplied by the MBE, whether the MBE is certified by the South Carolina Office of Small and Minority Business Assistance, and the value of the contract.

13.11 SEVERABILITY
If any provision or any part of a provision of the Contract Documents shall be finally determined to be superseded, invalid, illegal, or otherwise unenforceable pursuant to any applicable Legal Requirements, such determination shall not impair or otherwise affect the validity, legality, or enforceability of the remaining provision or parts of the provision of the Contract Documents, which shall remain in full force and effect as if the unenforceable provision or part were deleted.

13.12 ILLEGAL IMMIGRATION
Contractor certifies and agrees that it will comply with the applicable requirements of Title 8, Chapter 14 of the South Carolina Code of Laws and agrees to provide to the State upon request any documentation required to establish either: (a) that Title 8, Chapter 14 is inapplicable both to Contractor and its subcontractors or sub-subcontractors; or (b) that Contractor and its subcontractors or sub-subcontractors are in compliance with Title 8, Chapter 14. Pursuant to Section 8-14-60, "A person who knowingly makes or files any false, fictitious, or fraudulent document, statement, or report pursuant to this chapter is guilty of a felony, and, upon conviction, must be fined within the discretion of the court or imprisoned for not more than five years, or both." Contractor agrees to include in any contracts with its subcontractors language requiring its subcontractors to (a) comply with the applicable requirements of Title 8, Chapter 14, and (b) include in their contracts with the sub-subcontractors language requiring the sub-subcontractors to comply with the applicable requirements of Title 8, Chapter 14. (An overview is available at www.procurement.sc.gov)

13.13 SETOFF
The Owner shall have all of its common law, equitable, and statutory rights of set-off.

13.14 DRUG-FREE WORKPLACE
The Contractor certifies to the Owner that Contractor will provide a Drug-Free Workplace, as required by Title 44, Chapter 107 of the South Carolina Code of Laws, as amended.

13.15 FALSE CLAIMS
According to the S.C. Code of Laws § 16-13-240, "a person who by false pretense or representation obtains the signature of a person to a written instrument or obtains from another person any chattel, money, valuable security, or other property, real or personal, with intent to cheat and defraud a person of that property is guilty" of a crime.

13.16 NON-INDEMNIFICATION:
Any term or condition is void to the extent it requires the State to indemnify anyone. It is unlawful for a person charged with disbursements of state funds appropriated by the General Assembly to exceed the amounts and purposes stated in the appropriations. (§ 11-9-20) It is unlawful for an authorized public officer to enter into a contract for a purpose in which the sum is in excess of the amount appropriated for that purpose. It is unlawful for an authorized public officer to divert or appropriate the funds arising from any tax levied and collected for any one fiscal year to the payment of an indebtedness contracted or incurred for a previous year. (§ 11-1-40)

3.111 *Delete Section 14.1.1 and substitute the following:*

14.1.1 The Contractor may terminate the Contract if the Work is stopped for a period of 45 consecutive days through no act or fault of the Contractor or a Subcontractor, Sub-subcontractor or their agents or employees or any other persons or entities performing portions of the Work under direct or indirect contract with the Contractor, for any of the following reasons:

.1 Issuance of an order of a court or other public authority having jurisdiction that requires substantially all Work to be stopped; or

.2 An act of government, such as a declaration of national emergency that requires substantially all Work to be stopped.

.3 Because the Architect has not issued a Certificate for Payment and has not notified the Contractor of the reason for withholding certification as provided in Section 9.4.1, or because the Owner has not made payment on a Certificate for Payment within the time stated in the Contract Documents and the Contractor has stopped work in accordance with Section 9.7

3.112 *Insert the following at the end of Section 14.1.3:*

Any adjustment to the Contract Sum pursuant to this Section shall be made in accordance with the requirements of Article 7.

3.113 *In Section 14.1.4, replace the word "repeatedly" with the word "persistently."*

3.114 *Delete Section 14.2.1 and substitute the following:*

14.2.1 The Owner may terminate the Contract if the Contractor

.1 repeatedly refuses or fails to supply enough properly skilled workers or proper materials, or otherwise fails to prosecute the Work, or any separable part of the Work, with the diligence, resources and skill that will ensure its completion within the time specified in the Contract Documents, including any authorized adjustments;

.2 fails to make payment to Subcontractors for materials or labor in accordance with the Contract Documents and the respective agreements between the Contractor and the Subcontractors;

.3 repeatedly disregards applicable laws, statutes, ordinances, codes, rules and regulations, or lawful orders of a public authority; or

.4 otherwise is guilty of substantial breach of a provision of the Contract Documents.

3.115 *In Section 14.2.2, delete the parenthetical statement ", upon certification by the Initial Decision Maker that sufficient cause exists to justify such action," immediately following the word "Owner" in the first line.*

3.116 *In Section 14.2.4, replace the words "Initial Decision Maker" with the word "Architect"*

3.117 *Add the following Section 14.2.5:*

14.2.5 If, after termination for cause, it is determined that the Owner lacked justification to terminate under Section 14.2.1, or that the Contractor's default was excusable, the rights and obligations of the parties shall be the same as if the termination had been issued for the convenience of the Owner under Section 14.4.

3.118 *Delete the second sentence of Section 14.3.2 and substitute the following:*

Any adjustment to the Contract Sum made pursuant to this section shall be made in accordance with the requirements of Article 7.3.3.

3.119 *Delete Section 14.4.1 and substitute the following:*

14.4.1 The Owner may, at any time, terminate the Contract, in whole or in part for the Owner's convenience and without cause. The Owner shall give written notice of the termination to the Contractor specifying the part of the Contract terminated and when termination becomes effective.

3.120 *Delete Section 14.4.2 and substitute the following:*

14.4.2 Upon receipt of written notice from the Owner of such termination for the Owner's convenience, the Contractor shall

.1 cease operations as directed by the Owner in the notice;

.2 take actions necessary, or that the Owner may direct, for the protection and preservation of the Work;

.3 except for Work directed to be performed prior to the effective date of termination stated in the notice, terminate all existing subcontracts and purchase orders and enter into no further subcontracts and purchase orders; and

.4 complete the performance of the Work not terminated, if any.

3.121 *Delete Section 14.4.3 and substitute the following:*

14.4.3 In case of such termination for the Owner's convenience, the Contractor shall be entitled to receive payment for Work executed, costs incurred by reason of such termination, and any other adjustments otherwise allowed by the Contract. Any adjustment to the Contract Sum made pursuant to this Section 14.4 shall be made in accordance with the requirements of Article 7.3.3.

3.122 *Add the following Sections 14.4.4, 14.4.5, and 14.5:*

14.4.4 Contractor's failure to include an appropriate termination for convenience clause in any subcontract shall not (i) affect the Owner's right to require the termination of a subcontract, or (ii) increase the obligation of the Owner beyond what it would have been if the subcontract had contained an appropriate clause.

14.4.5 Upon written consent of the Contractor, the Owner may reinstate the terminated portion of this Contract in whole or in part by amending the notice of termination if it has been determined that:

.1 the termination was due to withdrawal of funding by the General Assembly, Governor, or Budget and Control Board or the need to divert project funds to respond to an emergency as defined by Regulation 19-445.2110(B) of the South Carolina Code of Regulations, as amended;

.2 funding for the reinstated portion of the work has been restored;

.3 circumstances clearly indicate a requirement for the terminated work; and

.4 reinstatement of the terminated work is advantageous to the Owner.

14.5 CANCELLATION AFTER AWARD BUT PRIOR TO PERFORMANCE
Pursuant to Title 11, Chapter 35 and Regulation 19-445.2085 of the South Carolina Code of Laws and Regulations, as amended, this contract may be canceled after award but prior to performance.

3.123 *Insert the following sentence after the second sentence of Section 15.1.1:*

A voucher, invoice, payment application or other routine request for payment that is not in dispute when submitted is not a Claim under this definition.

3.124 *Delete Section 15.1.2 and substitute the following:*

15.1.2 NOTICE OF CLAIMS
Claims by either the Owner or Contractor must be initiated by written notice to the other party and to the Architect. Such notice shall include sufficient information to advise the Architect and other party of the circumstances giving rise to the claim, the specific contractual adjustment or relief requested and the basis of such request. Claims by either party arising prior to the date final payment is due must be initiated within 21 days after occurrence of the event giving rise to such Claim or within 21 days after the claimant first recognizes the condition giving rise to the Claim, whichever is later except as stated for adverse weather days in Section 15.1.5.2. By failing to give written notice of a Claim within the time required by this Section, a party expressly waives its claim.

3.125 *Delete Section 15.1.3 and substitute the following:*

15.1.3 CONTINUING CONTRACT PERFORMANCE
Pending final resolution of a Claim, including any administrative review allowed under Section 15.6, except as otherwise agreed in writing or as provided in Section 9.7 and Article 14, the Contractor shall proceed diligently with performance of the Contract and the Owner shall continue to make payments in accordance with the Contract Documents. The Architect will issue Certificates for Payment in accordance with the initial decisions and determinations of the Architect.

3.126 *Insert the following at the end of Section 15.1.5.1:*

Claims for an increase in the Contract Time shall be based on one additional calendar day for each full calendar day that the Contractor is prevented from working.

3.127 *Insert the following Sub-Sections at the end of Section 15.1.5.2:*

.1 Claims for adverse weather shall be based on actual weather conditions at the job site or other place of performance of the Work, as documented in the Contractor's job site log.

.2 For the purpose of this Contract, a total of five (5) calendar days per calendar month (non-cumulative) shall be anticipated as "adverse weather" at the job site, and such time will not be considered justification for an extension of time. If, in any month, adverse weather develops beyond the five (5) days, the Contractor shall be allowed to claim additional days to compensate for the excess weather delays only to the extent of the impact on the approved construction schedule. The remedy for this condition is for an extension of time only and is exclusive of all other rights and remedies available under the Contract Documents or imposed or available by law.

.3 The Contractor shall submit monthly with their pay application all claims for adverse weather conditions that occurred during the previous month. The Architect shall review each monthly submittal in accordance with Section 15.5 and inform the Contractor and the Owner promptly of its evaluation. Approved days shall be included in the next Change Order issued by the Architect. Adverse weather conditions not claimed within the time limits of this Subparagraph shall be considered to be waived by the Contractor. Claims will not be allowed for adverse weather days that occur after the scheduled (original or adjusted) date of Substantial Completion.

3.128 *Delete Section 15.1.6 and substitute the following:*

15.1.6 CLAIMS FOR LISTED DAMAGES
Notwithstanding any other provision of the Contract Documents, including Section 1.2.1, but subject to a duty of good faith and fair dealing, the Contractor and Owner waive Claims against each other for listed damages arising out of or relating to this Contract.

15.1.6.1 For the Owner, listed damages are (i) lost revenue and profit, (ii) losses resulting from injury to business or reputation, (iii) additional or escalated overhead and administration expenses, (iv) additional financing costs, (v) costs suffered by a third party unable to commence work, (vi) attorney's fees, (vii) any interest, except to the extent allowed by Section 13.6 (Interest), (viii) lost revenue and profit for lost use of the property, (ix) costs resulting from lost productivity or efficiency.

15.1.6.2 For the Contractor, listed damages are (i) lost revenue and profit, (ii) losses resulting from injury to business or reputation, (iii) additional or escalated overhead and administration expenses, (iv) additional financing costs, (v) attorney's fees, (vi) any interest, except to the extent allowed by Section 13.6 (Interest); (vii) unamortized equipment costs; and, (viii) losses incurred by subcontractors for the types of damages the Contractor has waive as against the Owner. Without limitation, this mutual waiver is applicable to all damages due to either party's termination in accordance with Article 14. Nothing contained in this Section shall be deemed to preclude an award of liquidated damages, when applicable, in accordance with the requirements of the Contract Documents. This mutual waiver is not applicable to amounts due or obligations under Section 3.18 (Indemnification).

3.129 *Add the following Section 15.1.7:*

15.1.7 WAIVER OF CLAIMS AGAINST THE ARCHITECT
Notwithstanding any other provision of the Contract Documents, including Section 1.2.1, but subject to a duty of good faith and fair dealing, the Contractor waives all claims against the Architect and any other design professionals who provide design and/or project management services to the Owner, either directly or as independent contractors or subcontractors to the Architect, for listed damages arising out of or relating to this Contract. The listed damages are (i) lost revenue and profit, (ii) losses resulting from injury to business or reputation, (iii) additional or escalated overhead and administration expenses, (iv) additional financing costs, (v)

attorney's fees, (vi) any interest; (vii) unamortized equipment costs; and, (viii) losses incurred by subcontractors for the types of damages the Contractor has waive as against the Owner. This mutual waiver is not applicable to amounts due or obligations under Section 3.18 (Indemnification).

3.130 ***Delete the language of Sections 15.2, 15.3, and 15.4, including all Sub-Sections, and substitute the word "Reserved" for the deleted language of each Section and Sub-Section.***

3.131 *Add the following Sections 15.5 and 15.6 with their sub-sections:*

15.5 CLAIM AND DISPUTES - DUTY OF COOPERATION, NOTICE, AND ARCHITECTS INITIAL DECISION

15.5.1 Contractor and Owner are fully committed to working with each other throughout the Project to avoid or minimize claims. To further this goal, Contractor and Owner agree to communicate regularly with each other and the Architect at all times notifying one another as soon as reasonably possible of any issue that if not addressed may cause loss, delay, and/or disruption of the Work. If claims do arise, Contractor and Owner each commit to resolving such claims in an amicable, professional, and expeditious manner to avoid unnecessary losses, delays, and disruptions to the Work.

15.5.2 Claims shall first be referred to the Architect for initial decision. An initial decision shall be required as a condition precedent to resolution pursuant to Section 15.6 of any Claim arising prior to the date of final payment, unless 30 days have passed after the Claim has been referred to the Architect with no decision having been rendered, or after all the Architect's requests for additional supporting data have been answered, whichever is later. The Architect will not address claims between the Contractor and persons or entities other than the Owner.

15.5.3 The Architect will review Claims and within ten days of the receipt of a Claim (1) request additional supporting data from the claimant or a response with supporting data from the other party or (2) render an initial decision in accordance with Section 15.5.5.

15.5.4 If the Architect requests a party to provide a response to a Claim or to furnish additional supporting data, such party shall respond, within ten days after receipt of such request, and shall either (1) provide a response on the requested supporting data, (2) advise the Architect when the response or supporting data will be furnished or (3) advise the Architect that all supporting data has already been provided. Upon receipt of the response or supporting data, the Architect will render an initial decision in accordance with Section 15.5.5.

15.5.5 The Architect will render an initial decision in writing; (1) stating the reasons therefor; and (2) notifying the parties of any change in the Contract Sum or Contract Time or both. The Architect will deliver the initial decision to the parties within two weeks of receipt of any response or supporting data requested pursuant to Section 16.4, or within such longer period as may be mutually agreeable to the parties. If the parties accept the initial decision, the Architect shall prepare a Change Order with appropriate supporting documentation for the review and approval of the parties and the Office of State Engineer. If either the Contractor, Owner, or both, disagree with the initial decision, the Contractor and Owner shall proceed with dispute resolution in accordance with the provisions of Section 15.6.

15.5.6 In the event of a Claim against the Contractor, the Owner may, but is not obligated to, notify the surety, if any, of the nature and amount of the Claim. If the Claim relates to a possibility of a Contractor's default, the Owner may, but is not obligated to, notify the surety and request the surety's assistance in resolving the controversy.

15.6 DISPUTE RESOLUTION

15.6.1 If a claim is not resolved pursuant to Section 15.5 to the satisfaction of either party, both parties shall attempt to resolve the dispute at the field level through discussions between Contractor's Representative and Owner's Representative. If a dispute cannot be resolved through Contractor's Representative and Owner's Representative, then the Contractor's Senior Representative and the Owner's Senior Representative, upon the request of either party, shall meet as soon as conveniently possible, but in no case later than twenty-one days after such a request is made, to attempt to resolve such dispute. Prior to any meetings between the Senior Representatives, the parties will exchange relevant information that will assist the parties in resolving their dispute. The meetings required by this Section are a condition precedent to resolution pursuant to Section 15.6.2.

15.6.2 If after meeting in accordance with the provisions of Section 15.6.1, the Senior Representatives determine that the dispute cannot be resolved on terms satisfactory to both the Contractor and the Owner, then either party may submit the dispute by written request to South Carolina's Chief Procurement Officer for Construction (CPOC). Except as otherwise provided in Article 15, all claims, claims, or controversies relating to the Contract shall be resolved exclusively by the appropriate Chief Procurement Officer in accordance with Title 11, Chapter 35, Article 17 of the South Carolina Code of Laws, or in the absence of jurisdiction, only in the Court of Common Pleas for, or in the absence of jurisdiction a federal court located in, Richland County, State of South Carolina. Contractor agrees that any act by the State regarding the Contract is not a waiver of either the State's sovereign immunity or the State's immunity under the Eleventh Amendment of the United State's Constitution.

15.6.3 If any party seeks resolution to a dispute pursuant to Section 15.6.2, the parties shall participate in non-binding mediation to resolve the claim. If the claim is governed by Title 11, Chapter 35, Article 17 of the South Carolina Code of Laws as amended and the amount in controversy is $100,000.00 or less, the CPOC shall appoint a mediator, otherwise, the mediation shall be conducted by an impartial mediator selected by mutual agreement of the parties, or if the parties cannot so agree, a mediator designated by the American Arbitration Association ("AAA") pursuant to its Construction Industry Mediation Rules. The mediation will be governed by and conducted pursuant to a mediation agreement negotiated by the parties or, if the parties cannot so agree, by procedures established by the mediator.

15.6.4 Without relieving any party from the other requirements of Sections 15.5 and 15.6, either party may initiate proceedings in the appropriate forum prior to initiating or completing the procedures required by Sections 15.5 and 15.6 if such action is necessary to preserve a claim by avoiding the application of any applicable statutory period of limitation or repose.

15.6.5 SERVICE OF PROCESS
Contractor consents that any papers, notices, or process necessary or proper for the initiation or continuation of any claims, claims, or controversies relating to the Contract; for any court action in connection therewith; or for the entry of judgment on any award made, may be served on Contractor by certified mail (return receipt requested) addressed to Contractor at the address provided for the Contractor's Senior Representative or by personal service or by any other manner that is permitted by law, in or outside South Carolina. Notice by certified mail is deemed duly given upon deposit in the United States mail.

3.132 *Add the following Article 16:*

ARTICLE 16 PROJECT-SPECIFIC REQUIREMENTS AND INFORMATION

16.1. Inspection Requirements: *(Indicate the inspection services required by the Contract)*

☒ Special Inspections are required and are not part of the Contract Sum. *(see section 01400)*
☐ Building Inspections are required and are not part of the Contract Sum. *(see section 01400)*
☐ Building Inspections are required and are part of the Contract Sum. The inspections required for this Work are : *(Indicate which services are required and the provider)*

- ☒ Civil: By Agency
- ☒ Structural: By Agency
- ☐ Mechanical: _____
- ☐ Plumbing: _____
- ☐ Electrical: _____
- ☐ Gas: _____
- ☐ Other *(list)*: _____

Remarks: Independent Testing & Inspection as selected and paid by Agency.

16.1.1 Contractor shall schedule and request inspections in an orderly and efficient manner and shall notify the Owner whenever the Contractor schedules an inspection in accordance with the requirements of Section 16.1. Contractor shall be responsible for the cost of inspections scheduled and conducted without the Owner's knowledge and for any increase in the cost of inspections resulting from the inefficient scheduling of inspections.

16.2 List Cash Allowances, if any. *(Refer to attachments as needed* If *none, enter NONE)*
None

16.3. Requirements for Record Drawings, if any. *(Refer to attachments as needed.* If *none, enter NONE)*
Per Section 01 77 00

16.4. Requirements for Shop Drawings and other submittals, if any, including number, procedure for submission, list of materials to be submitted, etc. *(Refer to attachments as needed. If none, enter NONE)*
Per Sections 01 33 00 , 01 60 00 and technical specifications.

16.5. Requirements for signage, on-site office or trailer, utilities, restrooms, etc., in addition to the Contract, if any. *(Refer to attachments as needed. If none, enter NONE)*
Per section 01 15 00

16.6. Requirements for Project Cleanup in addition to the Contract, if any. *(Refer to attachments as needed. If none, enter NONE)*
None

16.7. List all attachments that modify these General Conditions. *(If none, enter NONE)*
None

USC SUPPLEMENTAL GENERAL CONDITIONS
FOR CONSTRUCTION PROJECTS

1. Contractor's employees shall take all reasonable means not to interrupt the flow of student traffic in building corridors, lobbies and stairs. All necessary and reasonable safety precautions shall be taken to prevent injury to building occupants while transporting materials and equipment through the building to the work area. Providing safe, accessible, plywood pedestrian ways around construction may be required if a suitable alternative route is not available.

2. Fraternization between Contractor's employees and USC students, faculty or staff is strictly prohibited-zero tolerance!

3. USC will not tolerate rude, abusive or degrading behavior on the job site. Heckling and cat-calling directed toward students, faculty or staff or any other person on USC property is strictly prohibited. Any contractor whose employees violate this requirement will be assessed a fine of up to $500 per violation.

4. Contractor's employees must adhere to the University's policy of maintaining a drug-free and smoke-free/tobacco free workplace.

5. Contractor must sign a Contractor Key Receipt/Return form before any keys are issued. Keys must be returned immediately upon the completion of the work. The Contractor will bear the cost of any re-keying necessary due to the loss of or failure to return keys.

6. A welding permit must be issued by the University Fire Marshall before any welding can begin inside a building. Project Manager will coordinate.

7. Contractor must notify the University immediately upon the discovery of suspect material such as those potentially containing asbestos or other such hazardous materials. These materials **must not** be disturbed until approved by the USC Project Manager.

8. The Contractor's lay-down area is as indicated on the drawings. This area will also be used for the Contractor's work vehicles. No personal vehicles will be allowed in this area, or in any areas surrounding the construction site that are not regular or authorized parking lots. Personal vehicles must be parked in the perimeter parking lots. Parking permits can be obtained at the USC Parking Office located in the Pendleton Street parking garage. The area will be maintained in a neat and orderly fashion. Vehicles parked in the lay down area (or designated parking areas) will be clearly marked or display a CPC furnished placard for identification.

9. Contractor will be responsible for providing its own temporary toilet facilities, unless prior arrangements are made with the USC Project Manager.

10. Use of USC communications facilities (telephones, computers, etc.) by the Contractor is prohibited, unless prior arrangements are made with the USC Project Manager.

11. For all projects over $100,000, including IDC's, an SE-395, Contractor Performance

Evaluation, will be completed by the USC Project Manager and reviewed with the GC at the beginning of the project and a copy given to the GC. At the end of the project the form will be completed and a Construction Performance rating will be established.

12. Contractor is responsible for removal of all debris from the site, and is required to provide the necessary dumpsters which will be emptied at least one time per week. Construction waste must not be placed in University dumpsters. THE CONSTRUCTION SITE MUST BE THOROUGHLY CLEANED WITH ALL TRASH PICKED UP AND PROPERLY DISPOSED OF ON A DAILY BASIS AND THE SITE MUST BE LEFT IN A SAFE AND SANITARY CONDITION EACH DAY. THE UNIVERSITY WILL INSPECT JOB SITES REGULARLY AND WILL FINE ANY CONTRACTOR FOUND TO BE IN VIOLATION OF THIS REQUIREMENT AN AMOUNT OF UP TO $1,000 PER VIOLATION.

13. **Contractor must provide all O&M manuals, as-built drawings, and training of USC personnel on new equipment, controls, etc. prior to Substantial Completion. Final payment will not be made until this is completed.**

14. The contractor will comply with all regulations set forth by OSHA and SCDHEC. Contractor must also adhere to USC's internal policies and procedures (available by request). As requested, the contractor will submit all Safety Programs and Certificates of Insurance to the University for review.

15. Tree protection fencing is required to protect existing trees and other landscape features to be preserved within a construction area. The limits of this fence will be evaluated for each situation with the consultant, USC Arborist and USC Project Manager. The tree protection fence shall be 5' high chain link fence unless otherwise noted or approved by USC Project Manager. No entry or materials storage will be allowed inside the tree protection zone. A 4" layer of mulch shall be placed over the tree protection area to maintain moisture in the root zone. Refer to drawings for additional details and requirements.

16. Where it is necessary to cross walks, tree root zones (i.e., under canopy) or lawns the following measures shall be taken: For single loads up to 9,000 lbs., a 3/4" minimum plywood base shall be placed over areas impacted. For single loads over 9,000 lbs., two layers of 3/4" plywood is required.

17. For projects requiring heavy loads to cross walks tree root zones or lawns. A construction entry road consisting of 10' X 16' oak logging mates on 12" coarse, chipped, hardwood base. Mulch and logging mats shall be supplemented throughout the project to keep matting structurally functional.

18. Any damage to existing landscaping (including lawn areas) will be remediated before final payment is made.

19. Orange safety fence to be provided by the contractor. (USC Arborist, Kevin Curtis may be contacted at 777-0033 or 315-0319)

Campus Vehicle Expectations

1. All motorized vehicles on the University campus are expected to travel and park on roadways and/or in parking stalls.

2. All motorized vehicle traffic on USC walkways must first receive the Landscape Manager's authorization. Violators may be subject to fines and penalties.

3. All motorized vehicles that leak or drip liquids are prohibited from traveling or parking on walks or landscaped areas.

4. Contractors, vendors, and delivery personnel are required to obtain prior parking authorization before parking in a designated space. Violators may be subject to fines and/or penalties. See Item 10 below.

5. Drivers of equipment or motor vehicles that damage university hardscape or landscape will be held personally responsible for damages and restoration expense.

6. Vehicle drivers who park on landscape or drives must be able to produce written evidence of need or emergency requiring parking on same.

7. All vehicles parked on landscape, hardscape, or in the process of service delivery, must display adequate safety devices, i.e. flashing lights, cones, signage, etc.

8. All drivers of equipment and vehicles will be respectful of University landscape, equipment, structures, fixtures and signage.

9. All incidents of property damage will be reported to Parking Services or the Work Management Center.

10. Parking on campus is restricted to spaces designated by Parking Services at the beginning of the project. Once the project manager and contractor agree on how many spaces are needed, the project manager will obtain a placard for each vehicle. This placard must be hung from the mirror of the vehicle, otherwise a ticket will be issued and these tickets cannot be "fixed". Parking spaces are restricted to work vehicles only; no personal vehicles.

Updated: July 15, 2011

Project Name: Darla Moore School of Business Construction – Bid Package 1C: Civil

Project Number: H27-6069-AC-1C

University of South Carolina

CONTRACTOR'S ONE YEAR GUARANTEE

STATE OF _____

COUNTY OF _____

WE_____
as General Contractor on the above-named project, do hereby guarantee that all work executed under the requirements of the Contract Documents shall be free from defects due to faulty materials and /or workmanship for a period of one (1) year from date of acceptance of the work by the Owner and/or Architect/Engineer; and hereby agree to remedy defects due to faulty materials and/or workmanship, and pay for any damage resulting wherefrom, at no cost to the Owner, provided; however, that the following are excluded from this guarantee;

Defects or failures resulting from abuse by Owner.

Damage caused by fire, tornado, hail, hurricane, acts of God, wars, riots, or civil commotion.

_____
[Name of Contracting Firm]

*By_____

Title_____

*Must be executed by an office of the Contracting Firm.

SWORN TO before me this
_____ day of _____, 2____ (seal)

_____State

My commission expires _____

SE-355 2011 Edition

Performance Bond

KNOW ALL MEN BY THESE PRESENTS, that *(Insert full name or legal title and address of Contractor)*

Name: _____
Address:_____
_____

hereinafter referred to as "Contractor", and *(Insert full name and address of principal place of business of Surety)*

Name: _____
Address:_____
_____

hereinafter called the "surety", are jointly and severally held and firmly bound unto *(Insert full name and address of Agency)*

Name: _____
Address:_____
_____

hereinafter referred to as "Agency", or its successors or assigns, the sum of _____($_____), being the sum of the Bond to which payment to be well and truly made, the Contractor and Surety bind themselves, their heirs, executors, administrators, successors and assigns, jointly and severally, firmly by these presents.

WHEREAS, Contractor has by written agreement dated _____ entered into a contract with Agency to construct

State Project Name: DMSoB Const. - Bid Package 1C: Civil
State Project Number: H27-6069-AC-1C
Brief Description of Awarded Work, as found on the SE-330, Bid Form: All Civil work as shown on Bid Documents

in accordance with Drawings and Specifications prepared by *(Insert full name and address of A/E)*

Name: Rafael Vinoly Architects PC
Address:50 Vandam Street
New York, NY 11013-1102

which agreement is by reference made a part hereof, and is hereinafter referred to as the Contract.

IN WITNESS WHEREOF, Surety and Contractor, intending to be legally bound hereby, subject to the terms stated herein, do each cause this Performance Bond to be duly executed on its behalf by its authorized officer, agent or representative.

DATED this _____day of _____, 2_____ BOND NUMBER _____
(shall be no earlier than Date of Contract)

CONTRACTOR	SURETY
By: _____ (Seal)	By: _____ (Seal)
Print Name: _____	Print Name: _____
Print Title: _____	Print Title: _____ (Attach Power of Attorney)
Witness: _____	Witness: _____

(Additional Signatures, if any, appear on attached page)

Performance Bond

NOW, THEREFORE, THE CONDITION OF THIS OBLIGATION IS SUCH THAT:

1. The Contractor and the Surety, jointly and severally, bind themselves, their heirs, executors, administrators, successors and assigns to the Agency for the full and faithful performance of the contract, which is incorporated herein by reference

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

3. The Surety's obligation under this Bond shall arise after:

3.1 The Agency has notified the Contractor and the Surety at the address described in paragraph 10 below, that the Agency 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 15 days after receipt of such notice to discuss methods of performing the Contract. If the Agency, the Contractor and the Surety agree, the Contractor shall be allowed a reasonable time to perform the Contract, but such an agreement shall not waive the Agency's right, if any, subsequently to declare a Contractor Default; or

3.2 The Agency has declared a Contractor Default and formally terminated the Contractor's right to complete the Contract.

4. The Surety shall, within 15 days after receipt of notice of the Agency's declaration of a Contractor Default, and at the Surety's sole expense, take one of the following actions:

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

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

4.3 Obtain bids or negotiated proposals from qualified contractors acceptable to the Agency for a contract for performance and completion of the Contract, arrange for a contract to be prepared for execution by the Agency and the contractor selected with the Agency's concurrence, to be secured with performance and payment bonds executed by a qualified surety equivalent to the Bonds issued on the Contract, and pay to the Agency the amount of damages as described in paragraph 7 in excess of the Balance of the Contract Sum incurred by the Agency resulting from the Contractor Default; or

4.4 Waive its right to perform and complete, arrange for completion, or obtain a new contractor, and:

4.4.1 After investigation, determine the amount for which it may be liable to the Agency and, within 60 days of waiving its rights under this paragraph, tender payment thereof to the Agency; or

4.4.2 Deny liability in whole or in part and notify the Agency, citing the reasons therefore.

5. Provided Surety has proceeded under paragraphs 4.1, 4.2, or 4.3, the Agency shall pay the Balance of the Contract Sum to either:

5.1 Surety in accordance with the terms of the Contract; or

5.2 Another contractor selected pursuant to paragraph 4.3 to perform the Contract.

5.3 The balance of the Contract Sum due either the Surety or another contractor shall be reduced by the amount of damages as described in paragraph 7.

6. 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 15 days after receipt of written notice from the Agency to the Surety demanding that the Surety perform its obligations under this Bond, and the Agency shall be entitled to enforce any remedy available to the Agency.

6.1 If the Surety proceeds as provided in paragraph 4.4, and the Agency refuses the payment tendered or the Surety has denied liability, in whole or in part, then without further notice the Agency shall be entitled to enforce any remedy available to the Agency.

6.2 Any dispute, suit, action or proceeding arising out of or relating to this Bond shall be governed by the Dispute Resolution process defined in the Contract Documents and the laws of the State of South Carolina.

7. After the Agency has terminated the Contractor's right to complete the Contract, and if the Surety elects to act under paragraph 4.1, 4.2, or 4.3 above, then the responsibilities of the Surety to the Agency shall be those of the Contractor under the Contract, and the responsibilities of the Agency to the Surety shall those of the Agency under the Contract. To a limit of the amount of this Bond, but subject to commitment by the Agency of the Balance of the Contract Sum to mitigation of costs and damages on the Contract, the Surety is obligated to the Agency without duplication for:

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

7.2 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

7.3 Damages awarded pursuant to the Dispute Resolution Provisions of the Contract. Surety may join in any Dispute Resolution proceeding brought under the Contract and shall be bound by the results thereof; and

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

8. The Surety shall not be liable to the Agency or others for obligations of the Contractor that are unrelated to the Contract, and the Balance of the Contract Sum 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 Agency or its heirs, executors, administrators, or successors.

9. The Surety hereby waives notice of any change, including changes of time, to the contract or to related subcontracts, purchase orders and other obligations.

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

11. Definitions

11.1 Balance of the Contract Sum: The total amount payable by the Agency to the Contractor under the Contract after all proper adjustments have been made, including allowance to the Contractor of any amounts to be received by the Agency 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 Contract.

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

SE-357

2011 Edition

Labor and Material Payment Bond

KNOW ALL MEN BY THESE PRESENTS, that *(Insert full name or legal title and address of Contractor)*

Name: _____
Address:_____
_____

hereinafter referred to as "Contractor", and *(Insert full name and address of principal place of business of Surety)*

Name: _____
Address:_____
_____

hereinafter called the "surety", are jointly and severally held and firmly bound unto *(Insert full name and address of Agency)*

Name: _____
Address:_____
_____

hereinafter referred to as "Agency", or its successors or assigns, the sum of _____($_____), being the sum of the Bond to which payment to be well and truly made, the Contractor and Surety bind themselves, their heirs, executors, administrators, successors and assigns, jointly and severally, firmly by these presents.

WHEREAS, Contractor has by written agreement dated _____ entered into a contract with Agency to construct

Project Name: DMSoB Const. - Bid Package 1C: Civil
Project Number: h27-6069-AC-1C
Brief Description of Awarded Work, as found on the SE-330, Bid Form: All Civil work as shown on Bid Documents.

in accordance with Drawings and Specifications prepared by *(Insert full name and address of A/E)*

Name: Rafael Vinoly Architects PC
Address:50 Vandam Street
New York, NY 10013-1102

which agreement is by reference made a part hereof, and is hereinafter referred to as the Contract.

IN WITNESS WHEREOF, Surety and Contractor, intending to be legally bound hereby, subject to the terms stated herein, do each cause this Labor and Material Payment Bond to be duly executed on its behalf by its authorized officer, agent or representative.

DATED this _____day of _____, 2_____ BOND NUMBER _____
(shall be no earlier than Date of Contract)

CONTRACTOR	SURETY
By: _____ (Seal)	By: _____ (Seal)
Print Name: _____	Print Name: _____
Print Title: _____	Print Title: _____ (Attach Power of Attorney)
Witness: _____	Witness: _____

(Additional Signatures, if any, appear on attached page)

Labor and Material Payment Bond

NOW, THEREFORE, THE CONDITION OF THIS OBLIGATION IS SUCH THAT:

1. The Contractor and the Surety, jointly and severally, bind themselves, their heirs, executors, administrators, successors and assigns to the Agency to pay for all labor, materials and equipment required for use in the performance of the Contract, which is incorporated herein by reference.

2. With respect to the Agency, 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 Agency from all claims, demands, liens or suits by any person or entity who furnished labor, materials or equipment for use in the performance of the Contract.

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. With respect to Claimants, and subject to the provisions of Title 29, Chapter 5 and the provisions of §11-35-3020(2)(c) of the SC Code of Laws, as amended, the Surety's obligation under this Bond shall arise as follows:

4.1 Every person who has furnished labor, material or rental equipment to the Contractor or its subcontractors for the work specified in the Contract, and who has not been paid in full therefore before the expiration of a period of ninety (90) days after the date on which the last of the labor was done or performed by him or material or rental equipment was furnished or supplied by him for which such claim is made, shall have the right to sue on the payment bond for the amount, or the balance thereof, unpaid at the time of institution of such suit and to prosecute such action for the sum or sums justly due him.

4.2 A remote claimant shall have a right of action on the payment bond upon giving written notice by certified or registered mail to the Contractor within ninety (90) days from the date on which such person did or performed the last of the labor or furnished or supplied the last of the material or rental equipment upon which such claim is made.

4.3 Every suit instituted upon a payment bond shall be brought in a court of competent jurisdiction for the county or circuit in which the construction contract was to be performed, but no such suit shall be commenced after the expiration of o ne year after the day on which the last of the labor was performed or material or rental equipment was supplied by the person bringing suit.

5. When the Claimant has satisfied the conditions of paragraph 4, the Surety shall promptly and at the Surety's expense take the following actions:

5.1 Send an answer to the Claimant, with a copy to the Agency, within sixty (60) days after receipt of the claim, stating the amounts that are undisputed and the basis for challenging any amounts that are disputed.

5.2 Pay or arrange for payment of any undisputed amounts.

5.3 The Surety's failure to discharge its obligations under this paragraph 5 shall not be deemed to constitute a waiver of defenses the Surety or Contractor may have or acquire as to a claim. However, if the Surety fails to discharge its obligations under this paragraph 5, the Surety shall indemnify the Claimant for the reasonable attorney's fees the Claimant incurs to recover any sums found to be due and owing to the Claimant.

6. Amounts owed by the Agency to the Contractor under the Contract shall be used for the performance of the Contract and to satisfy claims, if any, under any Performance Bond. By the Contractor furnishing and the Agency accepting this Bond, they agree that all funds earned by the contractor in the performance of the Contract are dedicated to satisfy obligations of the Contractor and the Surety under this Bond, subject to the Agency's prior right to use the funds for the completion of the Work.

7. The Surety shall not be liable to the Agency, Claimants or others for obligations of the Contractor that are unrelated to the Contract. The Agency 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.

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

9. Notice to the Surety, the Agency or the Contractor shall be mailed or delivered to the addresses shown on the signature page. Actual receipt of notice by Surety, the Agency or the contractor, however accomplished, shall be sufficient compliance as of the date received at the address shown on the signature page.

10. By the Contractor furnishing and the Agency accepting this Bond, they agree that this Bond has been furnished to comply with the statutory requirements of the South Carolina Code of Laws, as amended, and further, that any provision in this Bond conflicting with said statutory requirements shall be deemed deleted herefrom and provisions conforming to such statutory or other legal requirement shall be deemed incorporated herein. The intent is that this Bond shall be construed as a statutory Bond and not as a common law bond.

11. 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.

12. Any dispute, suit, action or proceeding arising out of or relating to this Bond shall be governed by the laws of the State of South Carolina.

13. DEFINITIONS

13.1 Claimant: An individual or entity having a direct contract with the Contractor or with a Subcontractor of the Contractor to furnish labor, materials, 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 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 might otherwise be asserted.

13.2 Remote Claimant: A person having a direct contractual relationship with a subcontractor of the Contractor or subcontractor, but no contractual relationship expressed or implied with the Contractor.

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

DIVISION 1- GENERAL REQUIREMENTS

SECTION 01 10 00 - SUMMARY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Project Identification: Darla Moore School of Business Construction, State Project No. H27-6069-AC, University of South Carolina, Columbia, South Carolina.

B. The Project consists of civil work associated with the construction of a new Business School for USC in Columbia, SC. The Project includes, but is not limited to: clearing, sediment and erosion control, selective demolition, earthwork, temporary and permanent shoring, storm drainage, site utilities, final grading, and asphalt and concrete paving.

C. This is a designated contract directed towards certified South Carolina based minority firms to satisfy the MINORITY BUSINESS goal of the Agency. However, this does not prevent other firms from bidding on this project.

1. Project Location: Columbia, South Carolina.
2. Owner: University of South Carolina.

D. Architect: The Architect of Record for the Project is Rafael Vinoly Architects PC, 50 Vandam Street, New York, NY 10013.

E. Construction Manager: The Construction Manager for the Project is the Joint Venture of Gilbane Cumming|SMG, 1213 Lady Street, Columbia, SC 29201.

1.3 COORDINATION OF WORK SEQUENCE

A. Coordinate performance of all work with the Construction Manager, Owner, and all other Prime Contractors and sub-contractors.

B. Coordinate work for the various sections of the Specifications to ensure efficient and orderly sequence of installation of construction elements, with provisions for accommodating items installed later.

C. Project Phasing Requirements: This project includes two phases of work and is part of a project with additional phases. Phases of the project are as indicated below and it is noted that the work of this contract will overlap with work that has been previously bid and awarded as well as with work of a subsequent phase. The contractor shall fully cooperate with the Owner and Construction Manager and shall coordinate their own activities so as not to interfere with the work of other contractors. Phasing and additional information is noted as follows:

1. Phase 1 Utility Relocation: This package has been previously awarded and work is currently underway. The package consists of work required to relocate a high voltage electrical service running across the west side of the project site. The physical work of the package is entirely within the right-of-way of Greene and Park Streets adjacent to the site

and the contractor does not have any work on the actual project site itself. This work must be completed prior to demolition of the current electrical feed and associated ductbank. It is also noted that the University is in the process of relocating telecom lines which also run across the project site and that these lines may not be disturbed until this process is complete. The existing ductbank and related structures must be protected during the initial work of the Civil package. Completion of telecom and electrical relocation work is anticipated within 35 calendar days of the bid date for this contract.

2. Bid Package 1C (THIS CONTRACT):

   a. Site Preparation: The first phase of work included in this contract (Bid Package 1C) is the preparation of the site for subsequent bid packages. Work includes site clearing and demolition, earthwork, permanent shoring, site utilities and other work as indicated on the contract documents.
   b. The primary intent of the BP-1C Civil Package shall be to establish grades and site conditions as indicated in the contract documents, access through the site to the building pad area, expedite installation of sediment and erosion control measures, establish utility rough-ins throughout the site, and to expedite the preparation of the site to aid in the timely commencement of other construction activities. The building pad for the building, and proper access to such, must be completed and ready for turnover to the **Phase 3** Structure Contractor no later than 75 days from the date of Notice of Commencement for this contract. Installation of said building pad shall be given the highest priority by this contractor. The balance of all work associated with the initial phase of work of Bid Package 1C shall be completed no later than one hundred forty four (144) days from the Date of Commencement for this contract. Work on other referenced construction packages will be ongoing during the work of this contract, and activities related to this contract shall be sequenced so as to not interfere with the timely progression of other building packages on the site.
   c. Completion of Site Civil: The second phase of work included in this contract will occur near the end of the project and includes fine grading of the site and preparation of sub-grade to receive hardscape or grassing and landscape, sidewalks, paving, grassing and other elements as indicated in the contract documents. The BP-1C Contractor will re-mobilize and commence work of this phase approximately 590 calendar days following the Date of Notice of Commencement and substantially complete the balance of work of the contract within 75 days of this date. Coordinate exact date with Construction Manager.

3. Phase 3 Structure: This package will consist of installation of foundations, permanent retaining walls and structure for the new building. This contractor will be responsible for backfill of retaining walls and building exterior to establish finish sub-grade elevation. The work associated with this package will commence prior to completion of the first phase of work of the BP-1C Civil Contractor. It is anticipated that this work will begin approximately 75 days from the date of Notice of Commencement for this contract.
4. Phase 4 Enclosure / Finishes and MEPF: This package will consist of the exterior walls, roofing, finishes, mechanical, plumbing, electrical and all other components necessary to complete construction of the new facility. This contractor will be onsite working when the BP-1C Civil contractor returns for the second phase of their work and will be required to leave the site clean, free of debris and at proper subgrade elevation to allow the BP-1C Civil Contractor to commence and complete their work.

1.4 TIME OF COMPLETION AND LIQUIDATED DAMAGES

A. For the first phase of work included in this contract (Bid Package 1C), the Date of Substantial Completion shall be one hundred forty four (144) calendar days from date of written Notice of Commencement.

B. For the second phase of work included in this contract (Bid Package 1C), the Contractor shall remobilize and commence work 590 calendar days following the Date of Notice of Commencement and the Date of Substantial Completion of this phase shall be seventy five (75) calendar days from the date of notification for this remobilization.

C. Should the contractor fail to have all work associated with each phase completed within the time specified, the contractor shall be accessed Liquidated Damages in the amount of two thousand dollars ($2,000.00) per calendar day that the actual Date of Substantial Completion exceeds the approved Date of Substantial Completion.

D. Final Completion is to be achieved within 30 days of the Date of Substantial Completion of Phase 2 work. If Final Completion is not achieved within this timeframe, and failing approval of the Construction Manager and Architect, the contractor will be assessed Liquidated Damages in the amount indicated above for each calendar day that Final Completion exceeds this timeframe.

1.5 USE OF PREMISES

A. General: Contractor shall have unlimited use of the premises for access and for demolition and construction operations, except as noted in the Project Phasing Requirements of this section. Use of the premises is limited by Owner's right to perform work and to retain other contractors on portions of Project.

B. Limit use of premises to allow:

1. Owner occupancy.
2. Work by Owner and Others.

C. Limit use of the premises to work in areas indicated. Confine operations to areas within contract limits indicated. Do not disturb existing conditions beyond the areas in which the Work is indicated.

1. Existing trees and other vegetation indicated to remain must be carefully protected from soil compaction or physical damage from construction traffic.

2. Perimeter fencing at the lay-down area across Park Street from the project site, and at portions of the project site itself, has been provided by the owner in locations shown on the drawings. The contractor is responsible for maintaining this fence in an acceptable condition to provide security for the site and lay-down area. The owner will remove fence and patch fence post holes at the end of construction. Any relocation of this fencing of additional fencing required by construction operations shall be the responsibility of the contractor.

D. Maintain Owner's continuous building services and operations. Construct Work in phases to accommodate Owner's occupancy requirements during the construction period. Coordinate construction schedule and operations with Owner.

E. The following are prohibited on the site:
1. Alcoholic beverages and drugs.
2. Smoking anywhere on premises.

3. Radios, televisions and other noise-making devices.
4. Dogs and other pets.
5. Workers' personal vehicles.
6. Advertising and protest signs.
7. Sale or trade of any items.

1.6 HAZARDOUS MATERIALS

A. Refer to Section 01732, "Selective Demolition."

1.7 SPECIFICATION FORMATS AND CONVENTIONS

A. Specification Format: The Specifications are organized into Divisions and Sections using the 33-Division format and CSI/CSC's "MasterFormat" numbering system.

1. Section Identification: The Specifications use Section numbers and titles to help cross-referencing in the Contract Documents. Sections in the Project Manual are in numeric sequence; however, the sequence is incomplete because all available Section numbers are not used. Consult the table of contents at the beginning of the Project Manual to determine numbers and names of Sections in the Contract Documents.
2. Division 1: Sections in Division 1 govern the execution of the Work of all Sections in the Specifications.

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

1. Abbreviated Language: Language used in the Specifications and other Contract Documents is abbreviated. Words and meanings shall be interpreted as appropriate. Words implied, but not stated, shall be inferred as the sense requires. Singular words shall be interpreted as plural, and plural words shall be interpreted as singular where applicable as the context of the Contract Documents indicates.

2. Imperative mood and streamlined language are generally used in the Specifications. Requirements expressed in the imperative mood are to be performed by Contractor. Occasionally, the indicative or subjunctive mood may be used in the Section Text for clarity to describe responsibilities that must be fulfilled indirectly by Contractor or by others when so noted.

   a. The words "shall," "shall be," or "shall comply with," depending on the context, are implied where a colon (:) is used within a sentence or phrase.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 10 00

SECTION 01 23 00 - ALTERNATES

PART 1 - GENERAL

1.01 DESCRIPTION

A. Work Includes: Provide alternative bid proposals as described in this Section.

B. Related Documents:

1. Documents affecting work of this Section include, but are not necessarily limited to, General Conditions, Supplementary Conditions, and all applicable Sections in Division 1 of these Specifications.

C. Procedures:

1. Provide alternative bids to be added to or deducted from the amount of the Base Bid if the corresponding change in scope is accepted by the Owner.

2. Include within the alternative bid prices all costs, including materials, submittals, installation, and fees to provide a complete, operable and finished system.

3. Show the proposed alternative amounts opposite their proper description of the Bid Form.

4. See Plans and Subparagraph 1.01.D of this specification for a description of alternates.

D. Alternative bid pricing is requested for the following:

1. **ALTERNATE NUMBER ONE:**

a) **Salvage of two trees.** Assist Owner's Representative in salvage operations for two trees as indicated on the plans and as described within the specifications. The Base Bid shall consist of mulching all trees as indicated on the drawings.

END OF SECTION

SECTION 01 25 00 – CHANGE ORDER PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. NO EXTRA WORK SHALL BE PERFORMED WITHOUT FIRST RECEIVING WRITTEN APPROVAL FROM THE CONSTRUCTION MANAGER.

B. Work included: Make such changes in the Work, in the Contract Sum, in the Contract Time of Completion, or any combination thereof, as are described in written Change Orders signed by the Owner and the Architect and issued after execution of the Contract, in accordance with provisions of this Section.

C. Related Work:

1. Documents affecting work of this Section include, but are not necessarily limited to, General Conditions, Supplementary Conditions, and Sections in Division 1 of these Specifications.
2. Changes in the Work are described further in Article 7 of the General Conditions.

1.3 QUALITY ASSURANCE

A. Include within the Contractor's quality assurance program such measures as are needed to assure familiarity of the Contractor's staff and employees with these procedures for processing Change Order data.

1.4 SUBMITTALS

A. Make submittals directly to the Construction Manager.

B. Submit the number of copies called for under the various items listed in this Section along with appropriate back-up materials.

1.5 PROCESSING CHANGES INITIATED BY THE OWNER

A. Should the Owner contemplate making a change in the Work or a change in the Contract Time of Completion, the Construction Manager and/or Architect will issue a Construction Change Directive to the Contractor.

1. Construction Change Directives will be dated and will be numbered in sequence.
2. The Construction Change Directives will describe the contemplated change, and will carry one of the following instructions to the Contractor:

   a. Make the described change in the Work at no change in the Contract Sum and no change in the Contract Time of Completion;

b. Make the described change in the Work, and provide for a credit or cost to be determined in accordance with Article 7 of the General Conditions.
c. Promptly advise the Construction Manager as to the credit or cost proposed for the described change. This will not be an authorization to proceed with the change.

B. If the Contractor has been directed by the Construction Manager and/or Architect to make the described change in the Work at no change in the Contract Sum and no change in the Contract Time of Completion, but the Contractor wishes to make a claim for one or both of such changes, the Contractor shall proceed with the change and shall notify the Construction Manager and/or Architect as provided for under subparagraphs 4.3.5 and 4.3.7 of the General Conditions.

C. If the Contractor has been directed by the Construction Manager and/or Architect to make the described change subject to later determination of cost or credit in accordance with Paragraph 7.3 of the General Conditions, the Contractor shall:

1. Take such measures as needed to make the change;
2. Consult with the Construction Manager and/or Architect and reach agreement on the most appropriate method for determining credit or cost for the change.

D. If the Contractor has been directed by the Construction Manager and/or Architect to promptly advise him as to credit or cost proposed for the described change, the Contractor shall:

1. Analyze the described change and its impact on costs and time.
2. Secure the required information and forward it to the Construction Manager for review.
3. Meet with the Construction Manager and/or Architect as required to explain costs and when appropriate, to determine other acceptable ways to achieve the desired objective.
4. Alert pertinent personnel and subcontractors as to the impending change and, to the maximum extent possible, avoid such work as would increase the Owner's cost for making the change, advising the Construction Manager and/or Architect in writing when avoidance no longer is practicable.

1.6 PROCESSING CHANGES INITIATED BY THE CONTRACTOR

A. Make written reply to the Construction Manager and/or Architect in response to each Construction Change Directive.

1. State proposed change in the Contract Sum, if any.
2. State proposed change in the Contract Time of Completion, if any.
3. Clearly describe other changes in the Work required by the proposed change, or desirable therewith, if any.
4. Include full backup data such as, subcontractor's letter of proposal or similar information.
5. Submit this response in a single copy.

B. When a cost or credit for the change has been agreed upon by the Owner and the Contractor, or the Owner has directed that cost or credit be determined in accordance with provisions of Article 7 of the General Conditions, the Construction Manager will issue a "Change Order" to the Contractor.

1.7 PROCESSING CHANGE ORDERS

A. Change Orders will be dated and will be numbered in sequence.

B. The Change Order will describe the change or changes, will refer to the Construction Change Directive(s) involved, and will be signed by the Owner, Construction Manager and the Architect.

C. The Construction Manager will issue five copies of each Change Order to the Contractor.

1. The Contractor shall promptly sign all five copies and return all five copies to the Construction Manager.
2. Should the change order exceed Agency certification limits, the Construction Manager will then forward five copies to the University and the University will forward to the OSE for review.
3. The Construction Manager will then forward five copies to the Architect for his signature.
4. The Architect will sign all five copies and then forward five copies to the Owner for his signature.
5. The Owner will sign all five copies, retain one copy for his file and return the remaining four copies to the Construction Manager who will then forward fully executed copies to the Contractor, and Architect.

D. Should the Contractor disagree with the stipulated change in Contract Sum or change in Contract Time of Completion, or both:

1. The Contractor promptly shall return three copies of the Change Order, unsigned by him, to the Construction Manager with copy to the Architect with a letter signed by the Contractor, stating his disagreement.
2. The Contractor's disagreement with the Change Order shall not in any way relieve the Contractor of his responsibility to proceed with the change as ordered under pertinent provisions of the Contract Documents.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 25 00

SECTION 01 29 00 – APPLICATIONS FOR PAYMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Work included: Comply with procedures described in this Section when applying for progress payments and final payment under the Contract.

B. Related Work:

1. Documents affecting work of this Section include, but are not necessarily limited to, General Conditions, Supplementary Conditions and Sections in Division 1 of these Specifications.
2. The Contract Sum and the schedule for payments are described in the Form of Agreement.
3. Payments upon Substantial Completion and Completion of the Work are described in the General Conditions and in Division I of these Specifications.
4. The Construction Manager's and Architect's approval of applications for progress payment and final payment may be contingent upon the Construction Manager's and Architect's approval of status of Project Record Documents as described in Section 01 77 00 of these Specifications.

1.3 QUALITY ASSURANCE

A. Prior to approval of payment application number one, secure the Construction Manager's approval of the project schedule and the schedule of values required to be submitted as further described in Section 01 29 01 of these Specifications.

B. During progress of the Work, modify the schedule of values as approved by the Construction Manager to reflect changes in the Contract Sum due to Change Orders or other modifications of the Contract.

C. Base requests for payment on the approved schedule of values.

1.4 SUBMITTALS

A. Informal Submittal: Unless otherwise directed by the Construction Manager:

1. Make an informal submittal of request for payment by filling in, with erasable pencil, pertinent portions of AIA Document G702, "Application and Certificate for Payment", plus continuation sheet or sheets.
2. Make this preliminary submittal of request for payment as agreed with the Construction Manager, initialing all copies.

B. Formal Submittal: Unless otherwise directed by the Construction Manager:

1. Make formal submittal of request for payment by filling in the agreed date, by typewriter or neat lettering in ink, on AIA Document G702, "Application and Certificate for Payment", plus continuation sheet or sheets.
2. On all payment applications, include the Project number, P.O. number and the Capital Projects number.
3. Sign and notarize the Application and Certificate for Payment.
4. Submit the original of the Application and Certificate for Payment, plus five (5) identical copies of the entire Application including all continuation sheet or sheets, to the Construction Manager. All copies shall bear original signatures and original notarizations.
5. The Construction Manager will compare the formal submittal with the approved informal submittal and, when approved, will sign the Application and Certificate for Payment, and will distribute:
   a. Six copies to Architect for Approval;
   b. After approval of Architect, Four copies to Owner.

6. Request for Payment against any change order will not be honored until the change order is signed by all appropriate parties.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 29 00

SECTION 01 29 01 – SCHEDULE OF VALUES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Work included: Provide a detailed breakdown of the agreed Contract Sum showing values allocated to each of the various parts of the Work, as specified herein and in other provisions of the Contract Documents.

B. Related Work:

1. Schedule of Values is required to be compatible with the continuation sheet and accompanying applications for payment, as described in Section 01 29 00.

1.3 QUALITY ASSURANCE

A. Use required means to assure arithmetical accuracy of the sums described.

B. When so required by the Construction Manager and/or Architect, provide copies of the subcontractor's Schedule of Values or other data acceptable to the Construction Manager and/or Architect, substantiating the sums described.

1.4 SUBMITTALS

A. Format and Content: Use the Project Manual Table of Contents as a guide to establish the format for the Schedule of Values.

1. Identification: Include the following Project identification on the Schedule of Values:

a. Project name and location.
b. Name of the Architect.
c. Project number.
d. Contractor's name and address.
e. Date of submittal.

2. Provide a breakdown of the Contract Sum in sufficient detail to facilitate continued evaluation of Applications for Payment and progress reports. Break principal subcontract amounts down into several line items.
3. Round amounts off to the nearest whole dollar; the total shall equal the Contract Sum.
4. For each part of the Work where an Application for Payment may include materials or equipment, purchased or fabricated and stored, but not yet installed, provide separate line items on the Schedule of Values for initial cost of the materials, for each subsequent stage of completion, and for total installed value of that part of the Work.
5. Margins of Cost: Show line items for indirect costs, and margins on actual costs, only to the extent that such items will be listed individually in Applications for Payment. Each item

shall be complete including its total cost and proportionate share of general overhead and profit margin.

a. Temporary facilities and other major cost items that are not direct cost of actual work-in-place shall be shown as separate line items in the Schedule of Values.

6. Schedule Updating: Update the Schedule of Values when Change Orders or Construction Change Directives result in a change in the Contract Sum.

B. Prior to first application for payment, submit a proposed schedule of values to the Construction Manager.

1. Meet with the Construction Manager and determine additional data, if any required to be submitted.
2. Secure the Construction Manager's approval of the schedule of values prior to submitting first application for payment. NO APPLICATIONS FOR PAYMENT WILL BE PROCESSED PRIOR TO APPROVAL OF THE SCHEDULE OF VALUES.
3. AIA Form G703 and "Form A" provided by the Construction Manager shall be submitted with all columns and spaces completed.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 29 00

SECTION 01 31 00 – PROJECT MANAGEMENT AND COORDINATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Work included: A. This Section includes administrative provisions for coordinating construction operations on the Project including, but not limited to, the following:

1. General project coordination procedures.
2. Conservation.
3. Administrative and supervisory personnel.
4. Project meetings.

1.3 COORDINATION

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

1. Schedule construction operations in sequence required to obtain the best results where installation of one part of the Work depends on installation of other components, before or after its own installation.
2. Coordinate installation of different components with other contractors to ensure maximum accessibility for required maintenance, service, and repair.
3. Make adequate provisions to accommodate items scheduled for later installation.

B. If necessary, prepare memoranda for distribution to each party involved, outlining special procedures required for coordination. Include such items as required notices, reports, and list of attendees at meetings.

C. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities and activities of other contractors to avoid conflicts and to ensure orderly progress of the Work. Such administrative activities include, but are not limited to, the following:

1. Preparation of Contractor's Construction Schedule.
2. Preparation of the Schedule of Values.
3. Installation and removal of temporary facilities and controls.
4. Delivery and processing of submittals.
5. Progress meetings.
6. Pre-installation conferences.
7. Project closeout activities.

D. Conservation: Coordinate construction activities to ensure that operations are carried out with consideration given to conservation of energy, water, and materials.

1.4 CONTRACTOR'S PERSONNEL

A. General: In addition to Project superintendent, provide other administrative and supervisory personnel as required for proper performance of the Work.

B. Staff Names: Within 15 days of starting construction operations, submit a list of principal staff assignments, including superintendent and other personnel in attendance at Project site. Identify individuals and their duties and responsibilities; list addresses and telephone numbers, including home and office telephone numbers. Provide names, addresses, and telephone numbers of individuals assigned as standbys in the absence of individuals assigned to Project.

1. Post copies of list in Project meeting room, in temporary field office, and by each temporary telephone.

1.5 PROJECT MEETINGS

A. General: The Construction Manager shall schedule and conduct meetings and conferences at Project site, unless otherwise indicated.

1. Attendees: The Construction Manager shall inform participants and others involved, and individuals whose presence is required, of date and time of each meeting. Notify Owner and Architect of scheduled meeting dates and times.
2. Agenda: The Construction Manager shall prepare the meeting agenda and distribute the agenda to all invited attendees.
3. Minutes: The Construction Manager shall record significant discussions and agreements achieved. Construction Manager to distribute the meeting minutes to everyone concerned, including Owner, Architect and Contractor, within five days of the meeting.

B. Pre-construction Conference: The Construction Manager shall schedule a pre-construction conference before starting construction, at a time convenient to Owner and Architect, but no later than 15 days after execution of the Agreement. Hold the conference at Project site or another convenient location. The Construction Manager shall conduct the meeting to review responsibilities and personnel assignments.

1. Attendees: Authorized representatives of Owner, Architect, Contractor and its superintendent; major subcontractors; manufacturers; suppliers; and other concerned parties shall attend the conference. All participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
2. Agenda: Discuss items of significance that could affect progress, including the following:

   a. Tentative construction schedule.
   b. Phasing.
   c. Critical work sequencing.
   d. Designation of responsible personnel.
   e. Procedures for processing field decisions and Change Orders.
   f. Procedures for processing Applications for Payment.
   g. Distribution of the Contract Documents.
   h. Submittal procedures.
   i. Preparation of Record Documents.
   j. Use of the premises.
   k. Responsibility for temporary facilities and controls.
   l. Parking availability.
   m. Office, work, and storage areas.
   n. Equipment deliveries and priorities.

o. Safety/first aid.
p. Security.
q. Progress cleaning.
r. Working hours.
s. Quality.
t. Waste Management Plan

C. Pre-installation Conferences: The Construction Manager shall conduct a pre-installation conference at Project site before each construction activity that requires coordination with other construction.

1. Attendees: Installer and representatives of manufacturers and fabricators involved in or affected by the installation and its coordination or integration with other materials and installations that have preceded or will follow, shall attend the meeting. The Construction Manager shall advise Owner, Architect and Contractor of scheduled meeting dates.
2. Agenda: Review progress of other construction activities and preparations for the particular activity under consideration, including requirements for the following:

a. Contract Documents.
b. Options.
c. Related Change Orders.
d. Purchases.
e. Deliveries.
f. Submittals.
g. Review of mockups.
h. Possible conflicts.
i. Compatibility problems.
j. Time schedules.
k. Weather limitations.
l. Manufacturer's written recommendations.
m. Warranty requirements.
n. Compatibility of materials.
o. Acceptability of substrates.
p. Temporary facilities and controls.
q. Space and access limitations.
r. Regulations of authorities having jurisdiction.
s. Testing and inspecting requirements.
t. Required performance results.
u. Protection of construction and personnel.

3. Minutes: The Construction Manager shall record significant discussions and agreements achieved. Construction Manager to distribute the meeting minutes to everyone concerned, including Owner, Architect and Contractor, within five days of the meeting
4. Do not proceed with installation if the conference cannot be successfully concluded. Initiate actions necessary to resolve impediments to performance of the Work and reconvene the conference at earliest feasible date.

D. Progress (Owner/Architect/Contractor - OAC) Meetings: The Construction Manager shall conduct progress meetings on the second and fourth Thursday of each month or at the convenience of all parties.

1. Attendees: In addition to representatives of Owner, Architect, Contractor, each major subcontractor, supplier, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these

meetings. All participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.

2. Agenda: Review and correct or approve minutes of previous progress meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.

   a. Contractor's Construction Schedule: Review progress since the last meeting. Determine whether each activity is on time, ahead of schedule, or behind schedule, in relation to Contractor's Construction Schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.
   b. Review present and future needs of each entity present, including the following:

      1) Interface requirements.
      2) Sequence of operations.
      3) Status of submittals.
      4) Deliveries.
      5) Off-site fabrication.
      6) Access.
      7) Site utilization.
      8) Temporary facilities and controls.
      9) Work hours.
      10) Hazards and risks.
      11) Progress cleaning.
      12) Quality and work standards.
      13) Change Orders.
      14) Requests for Information (RFIs).

3. Reporting: The Construction Manager Shall record significant discussion and agreements achieved. The Construction Manager shall distribute to everyone in attendance within five working days of the meeting.

   a. Schedule Updating: Revise Construction Schedule after each progress meeting where revisions to the schedule have been made or recognized. Issue revised schedule concurrently with the report of each meeting.

1.6 REQUESTS FOR INTERPRETATION (RFIs)

A. Procedure: Immediately on discovery of the need for interpretation of the Contract Documents, and if not possible to request interpretation at Project Meeting, prepare and submit an RFI in the form specified.

   1. RFIs shall originate with Contractor. RFIs submitted by entities other than Contractor will be returned with no response.
   2. Coordinate and submit RFIs in a prompt manner so as to avoid delays in Contractor's work or work of subcontractors.

B. Content of the RFI: Include a detailed, legible description of item needing interpretation and the following:

   1. Project name.
   2. Date.
   3. Name of Contractor.

4. Name of Architect.
5. RFI number, numbered sequentially.
6. Specification Section number and title and related paragraphs, as appropriate.
7. Drawing number and detail references, as appropriate.
8. Field dimensions and conditions, as appropriate.
9. Contractor's suggested solution(s). If Contractor's solution(s) impact the Contract Time or the Contract Sum, Contractor shall state impact in the RFI.
10. Name of the author of the RFI.
11. Attachments: Include drawings, descriptions, measurements, photos, Product Data, Shop Drawings, and other information necessary to fully describe items needing interpretation.

    a. Supplementary drawings prepared by Contractor shall include dimensions, thicknesses, structural grid references, and details of affected materials, assemblies, and attachments.

C. Hard-Copy RFIs:

1. Identify each page of attachments with the RFI number and sequential page number.

D. Software-Generated RFIs: Software-generated form with substantially the same content as indicated above.

1. RFI shall be electronic file in Microsoft Word format.
2. Attachments shall be electronic files in Adobe Acrobat PDF format.

E. Architect's Action: Architect will review each RFI, determine action required, and return it. Allow five working days for Architect's response for each RFI. RFIs received after 1:00 p.m. will be considered as received the following working day.

1. The following RFIs will be returned without action:

    a. Requests for approval of submittals.
    b. Requests for approval of substitutions.
    c. Requests for coordination information already indicated in the Contract Documents.
    d. Requests for adjustments in the Contract Time or the Contract Sum.
    e. Requests for interpretation of Architect's actions on submittals.
    f. Incomplete RFIs or RFIs with numerous errors.

2. Architect's action may include a request for additional information, in which case Architect's time for response will start again.
3. If Contractor believes the RFI response warrants change in the Contract Time or the Contract Sum, notify Construction Manager, Architect and Owner in writing within 10 days of receipt of the RFI response.

F. On receipt of Architect's action, update the RFI log and immediately distribute the RFI response to affected parties. Review response and notify Architect within five days if Contractor disagrees with response.

G. RFI Log: Prepare, maintain, and submit a tabular log of RFIs organized by the RFI number. Submit log at O.A.C. meetings.

1. Project name.
2. Name and address of Contractor.
3. Name and address of Architect
4. RFI number including RFIs that were dropped and not submitted.

5. RFI description.
6. Date the RFI was submitted.
7. Date Architect's response was received.
8. Identification of related Minor Change in the Work, Construction Change Directive, and Proposal Request, as appropriate.
9. Identification of related Field Order, Work Change Directive, and Proposal Request, as appropriate.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 31 00

SECTION 01 33 00 – SUBMITTAL PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes administrative and procedural requirements for submitting Shop Drawings, Product Data, Samples, and other miscellaneous submittals.

1.3 DEFINITIONS

A. Action Submittals: Written and graphic information that requires Architect's responsive action.

B. Informational Submittals: Written information that does not require Architect's approval. Submittals may be rejected for not complying with requirements.

1.4 GENERAL REQUIREMENTS

A. This Section specifies general requirements and procedures for preparing and submitting shop drawings, product data, and samples.

B. Submittal requirements specified in this Section apply to shop drawings, schedules, working drawings, certifications, calculations, test data, samples, product data and any other supplementary data required to amplify the Contract Drawings, show arrangements and details, and/or provide comprehensive descriptions of the Work to be performed.

1. Shop Drawings are drawings, diagrams, schedules and other data specially prepared for the Work by the Contractor or any Sub-contractor, manufacturer, supplier or distributor to illustrate some portion of the Work.
2. Product Data are illustrations, standard schedules, performance charts, instructions, brochures, diagrams and other information furnished by the Contractor to illustrate a material, product or system for some portion of the Work.
3. Samples and mock-ups are physical examples which illustrate materials, equipment or workmanship and establish standards by which the Work will be judged.

C. Submittal of shop drawings, product data, samples, etc., specially prepared for the Work by any Subcontractor, manufacturer, supplier, or distributor shall be made through the Contractor.

D. Calculations as submitted shall be certified by a Professional Engineer registered in the State of South Carolina and shall convey, or be accompanied by sufficient information to completely explain the structure, machine or system described and its intended manner of use.

E. Pertinent submittal requirements are specified in the several Sections of the Specifications. Specific requirements set forth in the Specifications for furnishing submittals for any particular portion of the Work shall not limit the obligation of the Contractor to furnish submittals for any other portion when so required.

F. The Contractor shall allow enough time for a maximum 3 full review and revision cycles for submittal of shop drawings, product data and samples to ensure an adequate allowance of time for the submittal process. A cycle is made up of the separate review/ revision periods of the Contractor and the Architect.

G. Refer to individual Specification Sections, to the General Conditions, and to other Sections in Division 1 for specific requirements on submittal of closeout information.

H. No portion of the Work requiring submission of shop drawings, product data, samples, etc., shall be commenced until the submittal has been reviewed, acted on, and satisfactorily completed. All such portions of the Work shall be completed in accordance with the accepted submittal, or submittals.

I. The Contractor shall be responsible for, and bear all cost of damages which may result from the ordering of any material or from proceeding with any part of the Work prior to approval, or acceptance, of the necessary submittals.

J. The Contractor shall review all submittals, forwarding to the Architect those submittals which meet the requirements of their section and returning to the Contractor for resubmission those submittals which require modification or adjustment.

K. Failure of the Architect to note unacceptable submissions shall not be deemed to relieve the Contractor of his responsibility for completing the Work in accordance with the requirements expressed in the Contract Documents.

1.5 CONTRACTOR'S USE OF ARCHITECT'S CAD FILES

A. General: At Contractor's written request, copies of Architect's CAD files will be provided to Contractor within the first sixty (60) days of the Notice to Proceed, for Contractor's use in connection with Project, subject to the following conditions:

1. Terms and Conditions of Use of Documents: Refer to Exhibit "A".

1.6 LEED BUILIDING Submittal Requirements.

A. The contractor or subcontractor shall submit the following LEED BUILDING certification items:

1. A completed LEED BUILDING MATERIALS CERTIFICATION FORM. Information to be supplied for this form shall include:

a. Material cost(s) for building materials included in contractor's or subcontractor's work. The Materials cost shall not include costs associated with contractor's or subcontractor's labor or equipment.
b. The amount of post consumer and/or post industrial recycled content in the supplied product(s).
c. The location of origin and manufacture for the supplied product(s).
d. The amount of "FSC Certified" wood product(s) used*.

2. Letters of Certification, provided from the product manufacturer on the manufacturer's letterhead, to verify the product information supplied for the LEED BUILDING MATERIALS CERTIFICATION FORM.

3. Product Cut Sheets for all materials that meet the LEED BUILDING Performance criteria identified in each specification.

4. Documentation for "FSC Certified" wood products. Provide Chain-of-Custody documentation, per Forest Stewardship Council criteria for all wood materials that require FSC Certification in these specifications.

5. Material Safety Data Sheets, for all applicable products. Applicable products include, but are not limited to adhesives, sealants, carpets, paints and coatings. Material Safety Data Sheets shall indicate the Volatile Organic Compound (VOC) limits of products submitted (If an MSDS does not include a product's VOC limits, then product data sheets, manufacturer literature, or a letter of certification from the manufacturer can be submitted in addition to the MSDS to indicate the VOC limits).

6. The LEED BUILDING Submittal information shall be assembled into one package per specification section (or per subcontractor), and sent to the Architect for review. Incomplete or inaccurate LEED BUILDING submittals may be used as the basis for the Architect's rejection of products or assemblies.

1.7 SUBMITTAL PROCEDURES

A. Electronic copies of CAD Drawings of the Contract Drawings will be provided by Architect for Contractor's use in preparing submittals.

B. The Contractor shall review all shop drawings, product data, and samples for compliance with the Contract Documents and shall certify that the Contractor has done so by stamp, or otherwise, affixed to each copy thereof. At the time of submission, the Contractor shall inform the Architect and Agency in writing of any deviation in the shop drawings, product data, or samples from the requirements of the Contract Documents.

   1. By approving and submitting shop drawings, product data and samples, the Contractor thereby represents that the Contractor has determined and verified all field dimensions, field construction criteria, materials, catalog numbers and similar data, or will do so, and that the Contractor has checked and coordinated each shop drawing, product data and sample with the requirements of the Work and the Contract Documents and shall so certify as required above.

C. Contractor shall prepare and process a submittal, with reasonable promptness and in orderly sequence so as to cause no delay in the Work or in the work of the Agency or any separate contractor, submittals required by the Contract Documents or subsequently by the Construction Manager, Architect, or the Agency, to more fully explain or illustrate some portion of the Work. Sequence submission of shop drawings, product data, samples, etc., such that all information is available for reviewing each submittal when it is received. Partial or piecemeal submittals are not acceptable and will be returned without action.

D. Contractor shall not make submittals which are incomplete or which do not comply with the Contract Documents.

E. Contractor shall coordinate and effectively sequence different categories of submittals for the same work and for interfacing units of the Work, so that one will not be delayed for lack of coordination with another.

F. Submittals shall indicate compliance with called for standards and codes, and identify materials. Coordination details shall be clearly noted. Include complete information for making necessary connections with related and adjoining Work.

G. By approving and submitting shop drawings, product data, samples, etc., the Contractor represents: (i) that he has determined and verified materials, quantities, dimensions, specified performance criteria, catalog numbers, field measurements, field construction criteria, installation requirements, and similar data related thereto, or will do so with reasonable promptness ; and, (ii) that he has checked, reviewed, and coordinated the information contained within each such submittal with other submittals and with the requirements of the Work and with the requirements appearing in the Contract Documents.

1. Data shown on submittals shall be complete with respect to quantities, dimensions, specified performance and design criteria, materials, and similar data to permit the Architect to review the information.
2. At the time of each submission, the Contractor shall give the Architect specific written notice of each variation that the submittal may have from the Contract Documents.
3. The Contractor shall note on resubmissions revisions other than the revisions or corrections on previous submittals.
4. Submittals which do not conform to the requirements stated in the Contract Documents will be considered unacceptable, unless otherwise determined acceptable under the provisions of Paragraph "REVIEW".
5. If the Contractor fails to describe such variations, he shall not be relieved of the responsibility for executing the Work in accordance with the requirements contained in the Contract Documents, even though submittals have been reviewed and approved, or accepted.

H. Deliver submittals to the Construction Manager, via courier service, hand conveyance, post paid express mail, United Parcel Service or other equally good and sufficient pre-paid delivery.

1. Delivery time is part of the review and revision period of the Contractor, Construction Manager or Architect initiating the delivery.
2. Charges in connection with the delivery of submittals to Architect's office or where directed by Construction Manager shall be paid by Contractor.
3. Submittals received after 5:00 P.M. will be logged in and considered received the next business day.

I. The Construction Manager shall review all submittals prior to distribution to the Architect for review. After review and if acceptable to the Construction Manager, the submittal shall be forwarded to the Architect for review with the Construction Manager's stamp indication the submittal has been reviewed. Construction Manager will return submittal that are incomplete or not in accordance with the requirements of the Contract Document. Returned submittals by the Construction Manager will not be considered in the review time process.

J. The Contractor shall initiate the submittal process for each submittal a minimum of 30 calendar days in advance of the date the approved submittal is required to ensure a timely and orderly sequence of construction without delay of the work.

K. A Submittal cycle begins the day the Construction Manager receives the submittal from the Contractor.

L. Once the submittal process is initiated, the Contractor must allow for all three complete review/ revision/ delivery periods by the Construction Manager and Architect to run consecutively without

interruption. For each party a period begins the day a submittal is received and ends one day prior to the day it is received by the next reviewing party.

M. Review Cycle:

1. Initial Review: Allow fifteen (15) calendar days for initial review of each submittal, or thirty (30) calendar days for complex submittals. Allow additional time if coordination with subsequent submittals is required. Construction Manager will advise Contractor when a submittal being processed must be delayed for coordination.
2. Intermediate Review: If intermediate submittal is necessary, process it in the same manner as initial submittal.
3. Resubmittal Review: Allow fifteen (15) working days for review of each resubmittal, or thirty (30) calendar days for complex resubmittals.
4. Concurrent Consultant Review: Where the Contract Documents indicate that submittals may be transmitted simultaneously to the Architect and the Architect's consultants, allow fifteen (15) days for review of each submittal. Submittal will be returned to the Architect before being returned to the Contractor.
5. If, after the second review of the submittal, approval or approval with corrections is not achieved, the Contractor shall meet with the Construction Manager and Architect to determine the necessary conditions required to achieve approval or approval with notations. Cost of the Architect's (and applicable Consultant's) time for additional reviews shall be borne by the Contractor.

N. If two review/ revision/ delivery periods have been completed without an approval of the submittal, the Contractor, Construction Manger and the Architect will hold a coordination meeting after the Contractor has reviewed the Architect's latest comments. This meeting shall take place during the Contractor's allotted review period and in no way suspends the time allotted for the submittal process.

O. Submittals shall be accompanied by a Submittal Form/Cover Sheet of transmittal from the Contractor. Number transmittals consecutively. Indicate if submittal is original or resubmittal. On resubmittals, note the Architect's file number and project identification.

P. Provide each submittal and letter Submittal Form/Cover Sheet with the all the data required to be filled in.

Q. The Construction Manager and Contractor shall maintain one (1) complete set of final submittals at project site for reference. Each Contractor shall maintain one (1) complete set of final submittals at plant or shop office and at the project site for reference.

R. Provide additional submittals for distribution to subcontractors, materialmen, suppliers, fabricators, governing authorities and others as necessary for proper performance of the Work. Include such additional copies in transmittal to Architect and Agency where required before final distribution. Record distribution on transmittal forms.

S. Each transmittal shall have a dated transmittal number (whether first, second, third, etc.) and each transmittal after the first shall be clear of previous stamps.

T. The Contractor shall review each submittal and if it is acceptable, meeting the requirements of this section and showing the correct scope of work, and shall certify in writing on the submittal and forward the submittal to the Architect and all other appropriate consultants for their review and action. Distribution to consultants shall be determined by the Architect.

U. Coordination: Coordinate preparation and processing of submittals with performance of construction activities.

1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.
2. Coordinate transmittal of different types of submittals for related parts of the Work so processing will not be delayed because of need to review submittals concurrently for coordination.

    a. Architect reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.

V. Submittals Schedule: Comply with requirements in Division 1 Section "Construction Progress Documentation" for list of submittals and time requirements for scheduled performance of related construction activities.

W. Identification: Place a permanent label or title block on each submittal for identification.

1. Indicate name of firm or entity that prepared each submittal on label or title block.
2. Provide a space approximately 8 x 8 inches on label or beside title block to record Contractor's review and approval markings and action taken by Architect.
3. Include the following information on label for processing and recording action taken:

    a. Project name.
    b. Date.
    c. Name and address of Architect.
    d. Name and address of Contractor.
    e. Name and address of subcontractor.
    f. Name and address of supplier.
    g. Name of manufacturer.
    h. Unique identifier, including revision number.
    i. Number and title of appropriate Specification Section.
    j. Drawing number and detail references, as appropriate.
    k. Other necessary identification.

X. Deviations: Highlight, encircle, or otherwise identify deviations from the Contract Documents on submittals.

Y. Transmittal: Package each submittal individually and appropriately for transmittal and handling. Transmit each submittal using a transmittal form. The Architect will return without review, submittals received from sources other than Contractor.

1. On an attached separate sheet, prepared on Contractor's letterhead, record relevant information, requests for data, revisions other than those requested by Architect on previous submittals, and deviations from requirements of the Contract Documents, including minor variations and limitations. Include the same label information as the related submittal.
2. Include Contractor's certification stating that information submitted complies with requirements of the Contract Documents.
3. Transmittal Form: Use AIA Document G810 or other form approved by Architect.

Z. Distribution: Furnish copies of final submittals to manufacturers, subcontractors, suppliers, fabricators, installers, authorities having jurisdiction, and others as necessary for performance of construction activities. Show distribution on transmittal forms.

AA. Use for Construction: Use only final submittals with mark indicating action taken by Architect in connection with construction.

1.8 SHOP DRAWING REQUIREMENTS

A. Provide shop drawings with graphic data accurately scaled and dimensioned. List reference Contract Drawing numbers and shop drawing numbers for related work by subcontractors, materialmen, sub-subcontractors, and fabricators. Do not base Shop Drawings on reproductions of the Contract Documents or standard printed data, unless submittal of Architect's CAD Drawings are otherwise permitted.

B. Symbols and numbers used on the Contract Drawings and in the Schedules shall be used on shop drawings or shall be shown in parenthesis. Items shown on shop drawings shall be clearly identified with their location in the Work, or by sheet or detail number in which they appear.

C. Contract Drawings shall not be reproduced or used for shop drawings or erection purposes without prior written approval of the Architect.

D. Number shop drawings consecutively. Shop drawings shall be of uniform size, form, and title as the Architect may require.

E. Drawings, the original design for which is the responsibility of the Contractor, shall bear the seal of a Professional Engineer registered in the State of South Carolina.

F. Shop drawings shall show design, dimensions, kinds of materials, connections, and other details necessary to insure that requirements appearing in the Contract Documents are accurately interpreted. Shop drawings shall show proper connections with adjoining work in detail. Where adjoining work requires shop drawings, such drawings shall be submitted for review at the same time so that connections can be accurately checked.

G. Shop drawings shall: (i) establish the actual detail of manufactured or fabricated items and indicate proper relation to adjoining work; (ii) incorporate minor changes of design or construction details to suit actual conditions; and, (iii) supplement the Contract Drawings by correctly reflecting field conditions and incorporating required field measurements. Identify and verify where field dimensions are required and obtain required field dimensions.

H. Where separate Sections are involved, shop drawings shall be coordinated and where required by the Architect shall be submitted in composite form clearly designating Section, subcontractor, or trade, and compliance responsibility. The words "work by others" will not be accepted.

I. The approval of shop drawings, product data or samples shall not relieve the Contractor of responsibility for any deviation from the requirements of the Contract Documents unless the Contractor has informed the Agency and the Professional in writing of such deviation at the time of submission and the Agency or the Architect has not objected to the specific deviation. The approval shall not relieve the Contractor from responsibility for errors or omissions in the shop drawings, product data, or samples. The approval of a separate item shall not indicate approval of an assembly in which the item functions.

J. If the Contractor considers any correction indicated on the revised shop drawings to constitute a change to the Contract Documents or Specification, written notice shall be given promptly to the Agency and the Architect.

K. Wiring Diagrams: Differentiate between manufacturer-installed and field-installed wiring.

1.9 COMPOSITE DRAWINGS

A. In the interest of coordination and expediting the Work in all areas, the Contractor shall prepare and submit to the Architect composite drawings embodying the Work of the various trades and/

or subcontractors involved.

B. After review, the Contractor shall distribute prints of reviewed composite drawings to affected trades and/ or subcontractors. Require that involved trades and/ or subcontractors cooperate in preparation of the composite drawings to assure proper coordination between trades and/ or subcontractors. Participating trades shall indicate their approval on these composite drawings.

C. Prepare composite drawings and installation layouts when required to solve field conditions. Such drawings shall include dimensioned plans, sections and elevations, shall indicate layout and dimensions of ductwork with relationship to plumbing, heating, and chilled water piping, and shall give complete information, particularly size and location of sleeves, inserts, attachments, openings, and structural interferences.

D. Prepare composite drawings at a scale of not less then 1/4 in. = 1 ft. 0 in. Show components at verified field locations. Insure allocation of adequate space for clearance, connection, maintenance, and accessibility.

E. On composite drawings, include the following:

1. Composite drawings and field installation layouts shall be coordinated in the field by designated Contractor and subcontractors for consistency and proper installation relationships based on field conditions. They shall be checked for accuracy and approved by affected subcontractors, trades, etc., before submission.

1.10 DRAWING SUBMITTAL PROCEDURES

A. Submit digital prints of shop drawings to the Architect. Distribution to consultants will be determined by the Architect.

B. The Contractor shall review the drawings to insure and certify that they comply with requirements of Contract Documents before delivering them to the Construction Manager.

1.11 REVIEW

A. Architect will review submittals in 14 calendar days. Review will be only for conformance with the design concept of the Project and with the information given in the Contract Documents and will not extend to means, methods, techniques, sequences or procedures of construction (except where specific means, methods, techniques, sequences or procedures of construction are required by the Contract Documents). The review and approval of a separate item as such will not indicate approval of the assembly in which the item functions. Contractor shall make corrections required and shall return the required number of corrected copies of shop drawings and submit as required new product data and samples for review and approval.

B. Review and approval of submittal samples shall not relieve Contractor from responsibility for any variation from the requirements appearing in the Contract Documents unless Contractor has in writing called the attention to each such variation at the time of submission and the Architect has given written approval of each such variation by a specific written notation thereof incorporated in or accompanying the shop drawing, product data, or sample approval; nor will any approval relieve Contractor from responsibility for errors or omissions in the submittal from responsibility for proper fitting of the Work, nor from the necessity of furnishing all work required by the Contract Documents.

C. Submittals need to be complete and Architect may return submittal without review in the event that adjacent assemblies, work of other trades, existing conditions, etc. are not adequately described to permit determination of the suitability of the submittal.

D. Following review, Architect will note one (1) of the following actions. The actions are:

1. "Provide as Submitted": "Provide as Submitted" means the submission is in general conformance with design concept. Construction, fabrication and/ or manufacture can proceed subject to the provision that the work shall be in accordance with the requirements of the Contract Documents. Final acceptance of the work shall be contingent upon such compliance.
2. "Provide as Noted": "Provide as Noted" means the submission is in general conformance with the design concept subject to notations on the returned Shop Drawings. Construction, fabrication and/ or manufacturer can proceed subject to the provision that the work shall be carried out in compliance with all annotations and/ or corrections indicated on the returned Shop Drawings and Product Data and in accordance with the requirements of the Contract Documents. Final acceptance of the work shall be contingent upon such compliance.
3. "Revise and Resubmit": "Revise and Resubmit" means that the Contractor shall revise and resubmit the Shop Drawings and Product Data in accordance with all annotations and/ or corrections indicated therein. If construction, fabrication and/ or manufacture proceeds it is at the Contractor's risk. Shop Drawings and Product Data bearing "Revise and Resubmit" stamp shall not be permitted on the Project Site.
4. "Rejected": "Rejected" means that the submission is rejected for nonconformance with the construction documents and the Contractor shall make a new submittal which shall comply with the requirements of the Contract Documents. If construction, fabrication and/ or manufacture proceeds it is at the Contractor's risk. Shop Drawings and Product Data bearing "Rejected" stamp shall not be permitted on the Project Site. Any submittal rejected shall not be considered a first cycle submittal for the purpose of scheduling subsequent reviews, i.e., restart submittal process.

   a. Do not use, or allow others to use, submittals marked "Amend and Resubmit" or "Rejected " at the Project Site or elsewhere where Work is in progress.

5. "No Action Required": "No Action Required" means submittal is for information or record purposes or special processing or other activity. The submittal will not be returned and the Contractor will be so notified.
6. "Submittal Not Required, Returned Without Review": "Submittal Not Required, Returned Without Review" means the submittal is a not required contract document submittal, and will be returned to the Contractor without review by the Architect.

E. Other Action: Where a submittal is primarily for information or record purposes, special processing, Quality Assurance or other activity, the submittal will not be returned, and Contractor will be so notified.

F. Contractor shall make corrections required and shall promptly resubmit the required number of corrected copies of shop drawings and product data until "Provide as Submitted", or "Provide as Corrected" is noted by the Architect.

G. Resubmittals shall be handled in the same manner as first submittals.

H. One (1) digital file, which will give the Contractor necessary instructions for correction of same, will be returned to the Contractor.

I. Contractor shall be responsible for correctness of dimensions other than principal controlling dimensions and properties described on the Contract Drawings, and shall call the attention of Architect to errors or discrepancies that he may discover therein.

J. Contractor shall have no claim for damages that may result from following an error except for an

error in principal controlling dimensions and properties shown on the Contract Drawings.

K. Contractor is similarly responsible for: (i) confirming and correlating quantities and dimensions; (ii) selecting fabrication processes, manufacturing details and workmanship, and techniques of construction; and, (iii) properly coordinating and synchronizing the Work in accordance with requirements expressed in the Contract Documents.

L. Actions which change Contract Price, or Prices, under any Pay Item, or Items, or time for completing performance, shall be brought to Agency's and Architect's attention before proceeding.

1. Carrying out of the Work or ordering of materials before receipt of written approval may constitute a cause for rejection of the Work or materials.

M. Contractor shall be responsible, and bear all cost of damages which may result from the ordering of any material or from proceeding with any part of the Work prior to review and approval of required submittals.

N. Shop drawings and other submittals, shall not be issued to the field or used in the Work without Architect's or required consultants' stamp of approval.

O. The Contractor shall forward one (1) copy of final submittals to the Agency's Representative.

1.12 PRODUCT DATA

A. Product data called for by the Contract Documents or subsequently by the Architect shall be properly provided as specified.

B. The Contractor shall make any corrections required and shall resubmit the required number of corrected copies of product data until approval, as required for shop drawings.

C. Submit digital copies, together with a letter of transmittal, to the Architect.

D. Highlight product data or note to indicate the specific characteristics of the product.

E. All product data shall be labeled identifying the Contractor or subcontractor and the work for which the product is submitted.

1.13 SAMPLES

A. Samples called for by the Contract Documents shall be properly provided by the Contractor as specified, or as the Architect may subsequently require.

B. Submit five (5) samples for each required sample submittal, unless otherwise indicated, together with a letter of transmittal, directly to the Architect and other consultants.

C. Samples shall be of sufficient size to show the quality, type, range of color, finish and texture of the material. Samples are for review and confirmation of color, pattern, texture, "kind" and other specified characteristics. Compliance with other requirements is the exclusive responsibility of the Contractor.

D. Each sample shall be labeled, both on the outside packing and on the samples themselves, giving the descriptive name and quality of the item, the Contractor's name, Subcontractor name, date, Contract and Project, and the Specification or Drawing reference related to the samples submitted and the name and address of the manufacturer of the sample, or samples, submitted.

E. Each label or tag shall have sufficient clear space to permit application of the Contractor's approval stamp and the Architect's Action Stamp.

F. Samples required for a particular Specification Section shall be submitted together. Samples shall be submitted from the same source which will supply the actual job.

G. Samples of materials or products which are normally furnished in containers or packages, which bear descriptive labels and/ or application or installation instructions, shall be submitted with such labels and/ or instructions.

H. Number sample transmittals consecutively in sequence with shop drawing and product data transmittals. Where appropriate, test data and/ or manufacturers' certificates shall be referenced in and forwarded with letters of transmittal.

I. Samples without accompanying certificates or test data will be returned without action.

J. In the event that a range of variations in texture, graining, color or other characteristics may be anticipated in furnished materials, assemblies, or elements of the Work, a sufficient number of samples of such materials or products shall be submitted to indicate the full range of characteristics which will be present in the materials or products proposed for the Work.

K. If examination discloses that the sample is not submitted to their satisfaction, the Architect shall give the Contractor the necessary instructions for correction. Upon correction, the Contractor shall resubmit the sample, or samples, and another review will be made. This procedure shall be repeated until the Contractor submits samples that are accepted.

L. Consideration and review of samples will only be made for the characteristic, color, texture, strength, or other feature of the material named in the Architect's finding of acceptability, and no other.

M. Valuable samples such as hardware, plumbing, and electrical equipment, parts, fixtures, controls, operating devices, not destroyed by inspection or test, will be returned to the Contractor and may be incorporated into the Work, providing suitable permanent records are made as to location of the samples.

N. When samples are accepted, supply one (1) piece to materialman's, fabricator's, manufacturer's, etc., shop, and retain one (1) sample in a suitable place at the Project site for use by all concerned as the standard for color, pattern, texture, kind, characteristic, etc., represented.

O. The Architect and Contractor shall each retain samples marked "Provide as Submitted" or "Provide as Corrected" intact to insure that the Work is completed in accordance with these samples.

1.14 INFORMATIONAL SUBMITTALS

A. General: Prepare and submit Informational Submittals required by other Specification Sections.

B. Number of Copies: Submit the same number of copies as required for Product Data,, unless otherwise indicated. Architect will not return copies.

C. Certificates and Certifications: Provide a notarized statement that includes signature of entity responsible for preparing certification. Certificates and certifications shall be signed by an officer or other individual authorized to sign documents on behalf of that entity.

D. Qualification Data: Prepare written information that demonstrates capabilities and experience of firm or person. Include lists of completed projects with project names and addresses, names and

addresses of architects and owners, and other information specified.

E. Welding Certificates: Prepare written certification that welding procedures and personnel comply with requirements. Submit record of Welding Procedure Specification (WPS) and Procedure Qualification Record (PQR) on AWS forms. Include names of firms and personnel certified.

F. Installer Certificates: Prepare written statements on manufacturer's letterhead certifying that Installer complies with requirements and, where required, is authorized for this specific Project.

G. Manufacturer Certificates: Prepare written statements on manufacturer's letterhead certifying that manufacturer complies with requirements. Include evidence of manufacturing experience where required.

H. Material Certificates: Prepare written statements on manufacturer's letterhead certifying that material complies with requirements.

I. Material Test Reports: Prepare reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting test results of material for compliance with requirements.

J. Preconstruction Test Reports: Prepare reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of tests performed before installation of product, for compliance with performance requirements.

K. Compatibility Test Reports: Prepare reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of compatibility tests performed before installation of product. Include written recommendations for primers and substrate preparation needed for adhesion.

L. Field Test Reports: Prepare reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of field tests performed either during installation of product or after product is installed in its final location, for compliance with requirements.

M. Product Test Reports: Prepare written reports indicating current product produced by manufacturer complies with requirements. Base reports on evaluation of tests performed by manufacturer and witnessed by a qualified testing agency, or on comprehensive tests performed by a qualified testing agency.

N. Research/Evaluation Reports: Prepare written evidence, from a model code organization acceptable to authorities having jurisdiction, that product complies with building code in effect for Project. Include the following information:

1. Name of evaluation organization.
2. Date of evaluation.
3. Time period when report is in effect.
4. Product and manufacturers' names.
5. Description of product.
6. Test procedures and results.
7. Limitations of use.
8. Maintenance Data: Prepare written and graphic instructions and procedures for operation and normal maintenance of products and equipment. Comply with requirements in Division 1 Section "Operation and Maintenance Data."
9. Design Data: Prepare written and graphic information, including, but not limited to, performance and design criteria, list of applicable codes and regulations, and calculations. Include list of assumptions and other performance and design criteria and a summary of

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

10. Manufacturer's Instructions: Prepare written or published information that documents manufacturer's recommendations, guidelines, and procedures for installing or operating a product or equipment. Include name of product and name, address, and telephone number of manufacturer. Include the following, as applicable:

    a. Preparation of substrates.
    b. Required substrate tolerances.
    c. Sequence of installation or erection.
    d. Required installation tolerances.
    e. Required adjustments.
    f. Recommendations for cleaning and protection.

O. Manufacturer's Field Reports: Prepare written information documenting factory-authorized service representative's tests and inspections. Include the following, as applicable:

1. Name, address, and telephone number of factory-authorized service representative making report.
2. Statement on condition of substrates and their acceptability for installation of product.
3. Statement that products at Project site comply with requirements.
4. Summary of installation procedures being followed, whether they comply with requirements and, if not, what corrective action was taken.
5. Results of operational and other tests and a statement of whether observed performance complies with requirements.
6. State whether or not conditions, products, and installation will affect warranty.
7. Other required items indicated in individual Specification Sections.

P. Insurance Certificates and Bonds: Prepare written information indicating current status of insurance or bonding coverage. Include name of entity covered by insurance or bond, limits of coverage, amounts of deductibles, if any, and term of the coverage.

Q. Material Safety Data Sheets: Submit information directly to Agency. If submitted to Architect, Architect will not review this information but will return it with no action taken.

1.15 CERTIFICATES OF COMPLIANCE

A. When required Contractor shall furnish authoritative evidence in the form of manufacturer's certificates of compliance that materials to be used in the Work have been manufactured and tested in conformity with the requirements appearing in the Contract Documents and are certified acceptable.

B. Certificates shall include copies of the results of physical tests and chemical analyses, where necessary, that have been made directly on the product, or on similar products, being fabricated by the manufacturer.

1. Certificates shall be delivered to the Architect prior to installation of material or equipment to which they refer.
2. Certificates of compliance shall contain the following information:

    a. Name of Project to which material is consigned and Contractor to whom material is supplied.
    b. Kind and quantity of material represented by the certificates.
    c. Shipment identification, label or seal marking.
    d. Date and method of shipment and means of identifying the consignment.

e. Statement that the material has been tested and found in conformity with the pertinent contractual requirements stated in the certificate.
f. Signature of a person having legal authority to bind the supplier.
g. Signature attested to by a Notary Public or other properly authorized person.

C. Notarized certificates of specific manufactured products shall be accompanied with appropriate manufacturer's literature and shall state required information relating to the material being supplied.

D. Certifications shall simply state that the items offered meet contractual requirements.

E. Submit certificates in triplicate. Individually sign and notarize each copy.

F. Certificates shall not be binding or conclusive on Agency and may be rejected at any time by Architect if incorrect, improper or otherwise unsatisfactory in his opinion.

1.16 REQUEST FOR INFORMATION

A. Notification by the Trade Contractor:

1. Submit requests for clarification or additional information in writing using the Request for Information (RFI) form.
2. Limit each RFI to one subject.
3. Submit RFI's if one of the following conditions occur:

a. Trade Contractor discovers an unforeseen condition or circumstance that is not described in the Contract Documents.
b. Trade Contractor discovers an apparent conflict or discrepancy between portions of the Contract Documents that appears to be inconsistent or is not reasonably inferred from the intent of the Contract Documents.
c. Trade Contractor discovers what appears to be an omission from the Contract Documents that cannot be reasonably inferred from the intent of the Contract Documents.

4. RFI's will not be recognized or accepted if, in the option of the Architect, one of the following conditions exist:

a. Contractor submits the RFI as a request for substitution.
b. Contractor submits the RFI as a submittal.
c. Contractor submits the RFI under the pretense of a Contract Document discrepancy or omission without thorough review of the Documents.
d. Contractor submits the RFI in a manner that suggests that specific portions of the Contract Documents be assumed or excluded, or by taking an isolated portion of the Contract Documents in part rather than whole.
e. Contractor submits an RFI in an untimely manner without proper coordination and scheduling of work or related trades.

5. Request for clarification or request for information immediately upon discovery. Submit RFI's in a reasonable time to not affect the project schedule while allowing the full response time described below.

B. Response Time:

1. The conclusive, will resolve questions and issue instruction to the Contractor within a reasonable time. Generally, most RFI's will receive a response within 5 business days. In

some cases, this time may be lengthened for complex issues, or shortened for emergency situations, as mutually agreed by all parties.

2. Should the Contractor proceed with the work affected before receipt of a response from the Architect, within the response time described above, any portion of the Work which is not in accordance with the Architect's interpretations, clarifications, instructions, or decisions, is subject to removal or replacement and the Contractor shall be responsible for all resultant losses.

C. Additional Detailed Instructions:

1. The Architect may furnish additional detailed, written instructions to further explain the Work and these instructions shall be a part of the Contract Documents. Should additional detailed instructions in the opinion of the Architect constitute Work in excess of the scope of the Contract, the Contractor shall submit written notification to the Architect within 7 calendar days following receipt of instructions, and in any event prior to the commencement of Work. The Architect will then consider such notice and if the Architect considered it justified, the Architect's instructions will be revised or an extra work authorization will be issued.
2. Contractor has no claim for additional compensation or extension of the schedule because of additional instructions unless the Contractor gives the Architect written notice within the time specified above.

D. Failure to Agree:

1. In the event of failure to agree to the scope of the instructions, the Contractor shall follow the procedures contained in the Contract Documents.

END OF SECTION 01 33 00

EXHIBIT "A"

Rafael Vinoly Architects, P.C. hereby agrees to provide the files to the User subject to the terms and conditions herein.

Rafael Vinoly Architects, P.C. makes no representation as to the accuracy of the CADD files. Rafael Vinoly Architects, P.C. is not responsible for any discrepancies between the CADD files and the printed construction documents. Any use of the files for drawings shall be at the User's own risk. Such use is acknowledgement of the User's acceptance of full responsibility and liability for the files' content. Documents are only available in the format provided. Compatibility of this electronic document with the User's software or hardware and any required formatting and cost thereof is solely the responsibility of the User. Any use of this electronic document is at sole risk and liability of the User, and does not relieve them of responsibility for verification of actual or intended dimensions, configurations, material or all other information contained within the document.

The User acknowledges that the computer files may vary from the hard copy drawings. The User acknowledges and agrees that the computer files are being delivered and accepted as is, with all faults and flaws, and may not be relied upon by the User as determinative of any professional obligation by Rafael Vinoly Architects, P.C. User specifically acknowledges that hard copy drawings signed by or on the behalf of Rafael Vinoly Architects, P.C. are the only documents for which Rafael Vinoly Architects, P.C. is professionally responsible. Rafael Vinoly Architects, P.C. gives no representations or warranties whatsoever in connection with its delivery of the electronic files. Any document information from CADD files shall be carefully coordinated with the contract documents.

The User acknowledges and agrees that the CADD files shall not be copied and returned to the Architect/Engineer as a submittal drawing without specific modifications necessary to communicate their work and execute their contract. Submittal documents not specifically modified by the User specific for their work shall be rejected. The User acknowledges and agrees that the electronic documents are not intended to be used for construction and any such use shall be at the sole risk of the User.

The User acknowledges and agrees that the CADD files are the sole property of Rafael Vinoly Architects, P.C.. Except for use as CADD files for the drawings on this project, CADD files may not be duplicated. The User may not use them as CADD files on any other project or allow them to be used by other persons. Use of CADD files is granted only for the preparation of drawing submittals by the USER on the subject project.

Rafael Vinoly Architects, P.C. is acknowledged as the Author, retaining all common law, statutory and other reserved rights, including copyright.

The User shall to the fullest extent permitted by law, indemnify and hold harmless Rafael Vinoly Architects, P.C. from and against all claims, damages, losses and expenses including attorney's fees, directly or indirectly, arising out of or alleged to arise out of or resulting from the use of computer files, including but not limited to all claims, damages, losses or expenses which may be attributable to bodily injury, sickness, or death, or to injury to or destruction of tangible property

Please acknowledge your acceptance of the terms of this agreement by signing and returning one copy for our records. Upon receipt of your written acceptance, we will release the CADD files to you.

_____	_____
Accepted	Date
_____	_____
Printed Name	Title/Firm

END OF SECTION 01 33 00

SECTION 01 40 00 – QUALITY REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes administrative and procedural requirements for quality assurance and quality control.

B. Quality control and quality assurance activities are required to verify compliance with requirements specified or indicated. These services do not relieve Contractor of responsibility for compliance with Contract Document requirements.

1. Specific quality-control requirements for individual construction activities are specified in the Sections that specify those activities. Requirements in those Sections may also cover production of standard products.
2. Specified tests, inspections, and related actions do not limit Contractor's quality-control procedures that facilitate compliance with Contract Document requirements.
3. Requirements for Contractor to provide quality-control services required by Architect, Owner, or authorities having jurisdiction are not limited by provisions of this Section.

C. Bidders are instructed that the Owner has previously engaged the services of a Testing Agency under separate contract. It shall be the responsibility of the contractor requiring the inspections or testing to adequately schedule and coordinate the timing of the inspections or tests. Specific testing, inspection and related requirements are specified in Divisions 2 through 17 sections. Refer to Division 1 sections 01 45 00 and 01 45 10 for specific responsibilities.

1.3 DEFINITIONS

A. Quality-Assurance Services: Activities, actions, and procedures performed before and during execution of the Work to guard against defects and deficiencies and ensure that proposed construction complies with requirements.

B. Quality-Control Services: Tests, inspections, procedures, and related actions during and after execution of the Work to evaluate that completed construction complies with requirements. Quality-control services do not include Contract enforcement activities performed by Architect.

C. Mockups: Physical assemblies illustrating materials and workmanship. Mockups are used to verify selections made under Sample submittals, to demonstrate aesthetic effects and, where indicated, qualities of materials and execution, and to review construction, coordination, testing, or operation; they are not Samples. Mockups establish the standard by which the Work will be judged.

D. Laboratory Mockups: Full-size, physical assemblies that are constructed at testing facility to verify performance characteristics.

E. Preconstruction Testing: Tests and inspections that are performed specifically for the Project before products and materials are incorporated into the Work to verify performance or compliance with specified criteria.

F. Product Testing: Tests and inspections that are performed by an NRTL, an NVLAP, or a testing agency qualified to conduct product testing and acceptable to authorities having jurisdiction, to establish product performance and compliance with industry standards.

G. Source Quality-Control Testing: Tests and inspections that are performed at the source, i.e., plant, mill, factory, or shop.

H. Field Quality-Control Testing: Tests and inspections that are performed on-site for installation of the Work and for completed Work.

I. Installer/Applicator/Erector: Contractor or another entity engaged by Contractor as an employee, Subcontractor, or Sub-subcontractor, to perform a particular construction operation, including installation, erection, application, and similar operations.

1. Using a term such as "carpentry" does not imply that certain construction activities must be performed by accredited or unionized individuals of a corresponding generic name, such as "carpenter." It also does not imply that requirements specified apply exclusively to trades people of the corresponding generic name.

J. Experienced: When used with an entity, "experienced" means having successfully completed a minimum of five previous projects similar in size and scope to this Project; being familiar with special requirements indicated; and having complied with requirements of authorities having jurisdiction.

K. Testing Agency: An entity engaged by the Owner to perform specific tests, inspections, or both. Testing laboratory shall mean the same as testing agency. The Testing Agency shall be supplied and paid for by the Owner.

1.4 CONFLICTING REQUIREMENTS

A. General: If compliance with two or more standards is specified and the standards establish different or conflicting requirements for minimum quantities or quality levels, comply with the most stringent requirement. Refer uncertainties and requirements that are different, but apparently equal, to Architect for a decision before proceeding.

B. Minimum Quantity or Quality Levels: The quantity or quality level shown or specified shall be the minimum provided or performed. The actual installation may comply exactly with the minimum quantity or quality specified, or it may exceed the minimum within reasonable limits. To comply with these requirements, indicated numeric values are minimum or maximum, as appropriate, for the context of requirements. Refer uncertainties to Architect for a decision before proceeding.

C. The "Summary" usually placed in the front part of each Section of the Specifications, is intended to designate the scope and locations of all items of the Work included therein, either generally or specifically. It is not intended to limit the Scope of Work should plans, schedules, or notes indicate an increased scope. Inadvertent omission of an item from its proper section of the Specifications and its inclusion in another section shall not relieve the Contractor of responsibilities for the item specified.

1.5 EXAMINATION OF CONTRACT DOCUMENTS

A. The Contractor will be held to have examined the Contract Documents, and Modifications thereto, as they may affect subdivisions of the Work and to have informed itself, its Subcontractors, Sub-subcontractors, and materialmen of all conditions thereof affecting the prosecution of the Work.

B. The Scope of Work for the Contract is not necessarily limited to the description of each section of the Specifications and the illustrations shown on the drawings. Include all minor items not expressly indicated in the Contract Documents, or as might be found necessary as a result of the field conditions, in order to complete the Work as it is intended, without any gaps between the various subdivisions of Work of the Contractor, or between the Work of Subcontractors.

C. Any failure by the Contractor to become acquainted with available information will not relieve the Contractor from responsibility for properly estimating the difficulty or cost of successfully performing the Work or mutually agreed changes thereto.

1.6 DELEGATED DESIGN

A. Performance and Design Criteria: Where professional design services or certifications by a design professional are required of Contractor by the Contract Documents, provide products and systems complying with performance and design criteria indicated.

1. If criteria indicated are not sufficient to perform services or certification required, submit a written request for additional information to Architect.

1.7 SUBMITTALS

A. Qualification Data: For testing agencies as specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include proof of qualifications in the form of a recent report on the inspection of the testing agency by a recognized authority.

B. Delegated-Design Submittal: In addition to Shop Drawings, Product Data, and other required submittals, submit a statement, signed and sealed by the responsible design professional, for each product and system Contractor to be designed or certified by a design professional, indicating that the products and systems are in compliance with performance and design criteria indicated. Include list of codes, loads, and other factors used in performing these services.

C. Reports: Prepare and submit certified written reports that include the following:

1. Date of issue.
2. Project title and number.
3. Name, address, and telephone number of testing agency.
4. Dates and locations of samples and tests or inspections.
5. Names of individuals making tests and inspections.
6. Description of the Work and test and inspection method.
7. Identification of product or system and Specification Section.
8. Complete test or inspection data.
9. Test and inspection results and an interpretation of test results.
10. Ambient conditions at time of sample taking and testing and inspecting.
11. Comments or professional opinion on whether tested or inspected Work complies with the Contract Document requirements.
12. Name and signature of laboratory inspector.

13. Recommendations on retesting and re-inspecting.

1.8 QUALITY ASSURANCE

A. Fabricator Qualifications: A firm experienced in producing products similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.

B. Factory-Authorized Service Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.

C. Installer Qualifications: A firm or individual experienced in installing, erecting, or assembling work similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful in-service performance.

D. Manufacturer Qualifications: A firm experienced in manufacturing products or systems similar to those indicated for this Project and with a record of successful in-service performance.

E. Professional Engineer Qualifications: A professional engineer legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of the system, assembly, or product that are similar to those indicated for this Project in material, design, and extent.

F. Testing Agency Qualifications: An agency with the experience and capability to conduct testing and inspection indicated, as documented by ASTM E 548, and that specializes in types of tests and inspections to be performed. Agency shall be approved by the authorities having jurisdiction, Owner, and Architect prior to performing testing and inspection.

G. Pre-construction Testing: Testing agency shall perform pre-construction testing for compliance with specified requirements for performance and test methods.

1. Contractor responsibilities include the following:

   a. Provide test specimens and assemblies representative of proposed materials and construction. Provide sizes and configurations of assemblies to adequately demonstrate capability of product to comply with performance requirements.
   b. Submit specimens in a timely manner with sufficient time for testing and analyzing results to prevent delaying the Work.
   c. Fabricate and install test assemblies using installers who will perform the same tasks for Project.
   d. When testing is complete, remove assemblies; do not reuse materials on Project.

2. Testing Agency Responsibilities: Submit a certified written report of each test, inspection, and similar quality-assurance service to the authorities having jurisdiction, Owner and Architect, with a copy to Contractor. Interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from the Contract Documents.

1.9 QUALITY CONTROL

A. Owner Responsibilities: Where quality-control services are indicated as Owner's responsibility, Owner will engage a qualified testing agency to perform these services.

1. Owner will furnish Contractor with names, addresses, and telephone numbers of testing agencies engaged and a description of the types of testing and inspecting they are engaged to perform.
2. Costs for retesting and re-inspecting construction that replaces or is necessitated by work that failed to comply with the Contract Documents will be charged to Contractor, and the Contract Sum will be adjusted by Change Order.

B. Contractor Responsibilities: Unless otherwise indicated, provide quality-control services specified and required by authorities having jurisdiction.

1. Where services are indicated as Contractor's responsibility, engage a qualified testing agency to perform these quality-control services.

a. Contractor shall not employ the same entity engaged by Owner, unless agreed to in writing by Owner.

2. Notify testing agencies at least 24 hours in advance of time when Work that requires testing or inspecting will be performed.
3. Where quality-control services are indicated as Contractor's responsibility, submit a certified written report, in duplicate, of each quality-control service performed.
4. Testing and inspecting requested by Contractor and not required by the Contract Documents are Contractor's responsibility.
5. Submit additional copies of each written report directly to authorities having jurisdiction, when they so direct.

C. Special Tests and Inspections:

1. Owner will engage a testing agency to conduct special tests and inspections required by authorities having jurisdiction as the responsibility of Owner.

a. Testing agency will notify the Owner, the Architect, and Contractor promptly of irregularities and deficiencies observed in the Work during performance of its services.
b. Testing agency will submit a certified written report of each test, inspection, and similar quality-control service to the Owner, and to the Architect with copy to Contractor.
c. Testing agency will submit a final report of special tests and inspections as soon as possible but prior to Substantial Completion, which includes a list of unresolved deficiencies.
d. Testing agency will interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from the Contract Documents.
e. Testing agency will retest and re-inspect and document corrected work.
f. Interim reports will be submitted periodically at a frequency agreed upon by the Owner and the code official prior to the start of Work.

2. Special inspection reports shall be delivered to the code official before covering or concealing structural elements.

D. Manufacturer's Field Services: Where indicated, engage a factory-authorized service representative to inspect field-assembled components and equipment installation, including service connections. Report results in writing.

E. Retesting/Re-inspecting: Regardless of whether original tests or inspections were Contractor's responsibility, provide quality-control services, including retesting and re-inspecting, for construction that revised or replaced Work that failed to comply with requirements established by the Contract Documents.

F. Testing Agency Responsibilities: Cooperate with Architect and Contractor in performance of duties. Provide qualified personnel to perform required tests and inspections.
   1. Notify Architect and Contractor promptly of irregularities or deficiencies observed in the Work during performance of its services.
   2. Interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from requirements.
   3. Submit a certified written report, in duplicate, of each test, inspection, and similar quality-control service through Contractor.
   4. Do not release, revoke, alter, or increase requirements of the Contract Documents or approve or accept any portion of the Work.
   5. Do not perform any duties of Contractor.

G. Associated Services: Cooperate with agencies performing required tests, inspections, and similar quality-control services, and provide reasonable auxiliary services as requested. Notify agency sufficiently in advance of operations to permit assignment of personnel. Provide the following:

   1. Access to the Work.
   2. Incidental labor and facilities necessary to facilitate tests and inspections.
   3. Adequate quantities of representative samples of materials that require testing and inspecting. Assist agency in obtaining samples.
   4. Facilities for storage and field-curing of test samples.
   5. Delivery of samples to testing agencies.
   6. Preliminary design mix proposed for use for material mixes that require control by testing agency.
   7. Security and protection for samples and for testing and inspecting equipment at Project site.

H. Coordination: Coordinate sequence of activities to accommodate required quality-assurance and quality-control services with a minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and inspecting.

PART 2 - PRODUCTS

A. (Not Used)

PART 3 - EXECUTION

3.1 REPAIR AND PROTECTION

A. General: On completion of testing, inspecting, sample taking, and similar services, repair damaged construction and restore substrates and finishes.

1. Provide materials and comply with installation requirements specified in other Sections of these Specifications. Restore patched areas and extend restoration into adjoining areas in a manner that eliminates evidence of patching.
2. Comply with the Contract Document requirements for Division 1 Section "Cutting and Patching."

B. Protect construction exposed by or for quality-control service activities.

C. Repair and protection are Contractor's responsibility, regardless of the assignment of responsibility for quality-control services.

END OF SECTION 01 40 00

SECTION 01 41 00 – REGULATORY REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. The following requirements of Regulatory Agencies having an interest in this project are hereby made a part of this Contract.

B. The construction of the project, including the letting of contracts in connection therewith, shall conform to the applicable requirements of State, territorial, and local laws and ordinances to the extent that such requirements do not conflict with Federal laws and this subchapter.

C. South Carolina Sales Tax: All applicable South Carolina sales tax shall be to the account of the Contractor.

D. Use of chemicals: All chemicals used during the project construction or furnished for project operation, whether herbicide, pesticide, disinfectant, polymer, reactant or of other classification, must show approval of EPA or USDA. Use of all such chemicals and disposal of residues shall be in strict conformance with instructions. All Termite pesticides shall be in strict accordance to South Carolina Pesticide Control Act [SC Law 46-13 and amendments] and Federal Regulations. The contractor shall notify Clemson University Pesticide Regulation and Controls program prior to beginning of treatment and application. All pesticides are under the jurisdiction of the Pesticide Control Act.

E. Safety and Health Regulations: The Contractor shall comply with the Department of Labor and Safety and Health Regulations for construction promulgated under the Occupational Safety and Health Act of 1970 (PL-91-596) and under Section 107 of the Contract Work Hours and Safety Standards Act (PL91-54).

F. Inspection by Agencies: The representatives of the Office of State Engineer, State Fire Marshall, South Carolina Department of Health and Environmental Control, South Carolina Department of Highways and Public Transportation and City of Columbia shall have access to the work wherever it is, in preparation or in progress, and the Contractor shall provide proper facilities for such access and inspection.

G. Withholding for Non-Residents shall comply with the following:

1. Attention of non-resident contractors is invited to Part Two, Act No. 855, Acts of the General Assembly of South Carolina 1958.
2. If a non-resident contractor is the successful bidder on this project, he shall be required to post surety bond, or deposit cash or securities with the South Carolina Tax Commission in compliance with the Act. Proof of such coverage shall be filed with the Engineer before work is started.
3. If the Contractor fails to comply with the regulations of the South Carolina Tax Commission, two percent (2%) of each and every payment made to the Contractor shall be retained by the Owner to satisfy such requirements.

H. The Owner shall provide and maintain competent and adequate observation of construction as required by 40 CFR 35.2214.

PART 2 - PRODUCTS

(Not Used)

PART 3 - EXECUTION

(Not Used)

END OF SECTION 01 41 00

SECTION 01 42 00 – REFERENCES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 DEFINITIONS

A. "Approved": The term "approved," is used to convey Architect's action on Contractor's submittals, applications, and requests.

B. Approved Equal, Accepted Equal, Equal": A product or system determined by the Architect to be equivalent to or better than that indicated, and acceptable for use in the project.

C. By Others": Work performed by the Owner or other contractors, and that is outside the scope of the Work of this Contract.

D. Directed": Terms such as "directed," "requested," "authorized," "selected," "approved," "required," and "permitted" mean directed by Architect, requested by Architect, and similar phrases.

E. Furnish": To supply and deliver to Project site, ready for unloading, unpacking, assembly, installation, and similar operations; installation is not included.

F. "Indicated": Graphic representations, notes, or schedules on Drawings; written representations such as Specifications or schedules; and similar requirements in the Contract Documents. Terms such as "shown," "noted," "scheduled," and "specified" are intended to have similar meanings.

G. "Install": To incorporate in the Work, including unloading, temporarily storing, unpacking, assembling, erecting, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning, and similar operations at the Project site.

H. "Installer": The Contractor or another entity engaged by Contractor as an employee, Subcontractor, or Sub-subcontractor, who performs operations such as installation, erection, application, and similar operations.

1. The term "experienced," when used with an entity, means having successfully completed a minimum of five previous projects similar in size and scope to this Project; being familiar with special requirements indicated; and having complied with requirements of authorities having jurisdiction.
2. Using a term such as "carpentry" does not imply that certain construction activities must be performed by accredited or unionized individuals of a corresponding generic name, such as "carpenter." It also does not imply that requirements specified apply exclusively to trades-people of the corresponding generic name.

I. "Project Site": The space available for performing construction activities. The extent of Project site is shown on Drawings.

J. "Provide": Furnish and install, complete and ready for the intended use.

K. "Regulations": Laws, ordinances, statutes, and lawful orders issued by authorities having jurisdiction, as well as rules, conventions, and agreements within the construction industry that control performance of the Work.

1.3 INDUSTRY STANDARDS

A. Applicability of Standards: Unless the Contract Documents include more stringent requirements, applicable construction industry standards have the same force and effect as if included in the Contract Documents to the extent referenced. Such standards are made a part of the Contract Documents by reference.

B. Publication Dates: Comply with standards in effect as of the date on the Contract Documents, unless otherwise indicated.

C. Conflicting Requirements: If compliance with two or more standards is specified and the standards establish different or conflicting requirements for minimum quantities or quality levels, comply with the most stringent requirement. Refer uncertainties and requirements that are different, but apparently equal, to Architect for a decision before proceeding.

1. Minimum Quantity or Quality Levels: The quantity or quality level shown or specified shall be the minimum provided or performed. The actual installation may comply exactly with the minimum quantity or quality specified, or it may exceed the minimum within reasonable limits. To comply with these requirements, indicated numeric values are minimum or maximum, as appropriate, for the context of requirements. Refer uncertainties to Architect for a decision before proceeding.

D. Abbreviations and Acronyms for Industry Organizations: Where abbreviations and acronyms are used in the Contract Documents, they shall mean the recognized name of the entities indicated in Gale Research's "Encyclopedia of Associations" or in Columbia Books' "National Trade & Professional Associations of the U.S."

PART 2 - PRODUCTS

(Not Used)

PART 3 - EXECUTION

(Not Used)

END OF SECTION 01 42 00

SECTION 01 45 00 – QUALITY CONTROL AND TESTING SERVICES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Work included:

1. The Owner has previously engaged the services of a Testing Agency under separate contract. It shall be the responsibility of the contractor requiring the inspections or testing to adequately schedule and coordinate the timing of the inspections or tests.
2. Provide testing, inspecting, complete, as described in this section and elsewhere in pertinent section of the project manual.
3. Provide construction of small-scale sample of work as may be described in pertinent section of the project manual.
4. Remove and replace defective work.

B. Related work:

1. Requirements for testing may be described in various Sections of these Specifications.
2. Where no testing requirements are described, but the Owner decides that testing is required, the Owner may require such testing to be performed under current pertinent standards for testing. Payment for such testing will be made as described in this Section.

1.3 QUALITY ASSURANCE

A. Testing, when required, will be in accordance with all pertinent codes and regulations, and with selected standards of the American Society for Testing and Materials.

1.4 SUBMITTALS

A. Upon completion and/or inspections, the Testing Agency will promptly distribute copies of test or inspection reports to the Construction Manager, Contractor, Architect, to governmental agencies requiring submission of such reports, and to such other persons as directed by the Construction Manager.

PART 2 - PRODUCTS

2.1 PAYMENT FOR TESTING

A. Quality control testing will be paid for by the Owner to cover all testing and inspecting under this Section of these Specifications. The contractor is responsible for scheduling and arranging for all testing and inspecting required by governmental agencies having jurisdiction, with the exception of Chapter 1 and 17 testing & inspections as detailed in Section 01 45 10.

B. When initial tests requested by the Architect\Engineer indicate non-compliance with the contract documents, subsequent retesting occasioned by the non-compliance shall be performed by the same testing laboratory and the costs thereof shall be paid by the Contractor.

C. It shall be understood and agreed by all involved that the Testing Laboratory is the Owner's agent and representative. By accepting the work of this job, the Laboratory agrees to represent the Owner alone. All reports shall be sent directly to the Owner, the Architect, the Engineer, and the Construction Manager. No reports will be sent to the Contractor alone or through the Contractor. The Construction Manager will provide copies of all reports to the contractor for his use.

D. Where test, certificates or approvals by authorities other than the Architect\Engineer are required for an item or material, the Contractor shall have such test performed and\or procure such certifications of approval. The Testing Agency will forward four copies of the results of the test certificates or approvals to the Construction Manager prior to the Contractor proceeding with the work involved. Such laboratories and\or authorities as are employed for this purpose shall be competent, with a generally recognized reputation in the field concerned and shall be subject to approval by the Architect.

2.2 SPECIFIC TESTS AND INSPECTIONS

A. Inspection and testing required by codes or ordinances, or by a plan approval authority, and which are made by a legally constituted authority, shall be the responsibility of and shall be paid for by the Contractor, unless otherwise provided in the Contract Documents.

B. Testing shall include, but not be necessarily limited to that described in detail in Part 3 of this Section.

2.3 CONTRACTOR'S CONVENIENCE TESTING

A. Inspecting and testing performed exclusively for the Contractor's convenience shall be the sole responsibility of the Contractor and the contractor shall be responsible for payment for such services.

PART 3 - EXECUTION

3.1 COOPERATION WITH TESTING LABORATORY

A. Representatives of the testing laboratory shall have access to the Work at all times and at all locations where the Work is in progress. Provide facilities for such access to enable the laboratory to perform its functions properly.

3.2 TAKING SPECIMENS

A. All specimens and samples for testing, unless otherwise provided in the Contract Documents, shall be taken by the testing personnel. All sampling equipment and personnel will be provided by the testing laboratory. All deliveries of specimens and samples to the testing laboratory will be performed by the testing laboratory.

3.3 SPECIFIC TESTING REQUIREMENTS

A. Testing requirements are identified within the Technical Specifications sections of the project Manual. Required inspections and tests generally pertain to, but are not necessarily limited to:
   1. Division 31 - Earthwork
   2. Division 3 - Concrete

3.4 WAIVER OF INSPECTION AND/OR TESTING

A. Specified inspections and/or tests may be waived only by the specific approval of the Architect or Engineer.

END OF SECTION 01 45 00

SECTION 01 45 10 – COLLECTIVE INSPECTIONS AND STRUCTURAL TESTING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Bidders are instructed that the Owner has previously engaged the services of an Inspector(s) to perform required inspections. A Testing Agency has also been procured under separate contract as identified in section 01 45 00 of these specifications. It shall be the responsibility of the contractor requiring the inspections or testing to adequately schedule and coordinate the timing of the inspections or tests. Tables for Chapter 1 and Chapter 17 inspections on Page 6 of this section provide information with respect to the required inspections.

B. This section includes a listing of both special and required inspections to be performed during the progress of this project. A "Certificate of Substantial Completion" cannot be issued without documentation that these inspections have been performed and the work is in conformance with the Contract Documents.

C. Related Work: Requirements of Section 01 45 00 Quality Control and Testing Services shall apply to this section. This section includes additional requirements for Inspections.

1.3 RESPONSIBILTY

A. It shall be the Owner's responsibility to contract and remit payment for these Inspections; however, the Contractor shall be responsible for proper notification when inspection is required in the progress of the work, providing access to facilitate the inspection and making corrections necessary when work is not in compliance with the Contract Documents.

B. When initial inspections or tests requested by the Code or the Architect\Engineer indicate non-compliance with the Code or the Contract Documents, subsequent re-inspections occasioned by the non-compliance shall be performed by the Owner's inspections agent and the costs thereof shall be paid by the Contractor.

1.4 REPORTS

A. Copies of inspection reports signed by person performing the inspection or test shall be submitted to the Construction Manager, Architect, Contractor and Building Official. A copy shall also be kept in the job trailer.

1.5 GENERAL REQUIREMENTS

A. Inspections and Structural Testing shall be in accordance with Chapter 1 & 17 of the 2009 International Building Code.

B. The program of Inspections and Structural Testing is a Quality Assurance Program intended to ensure that the work is performed in accordance with the Contract Documents.

C. This specification section is intended to inform the Contractor of the Owner's Quality Assurance Program and the extent of the Contractor's responsibilities. This specification section is also intended to notify the Inspector and other Agents of the Inspector of their requirements and responsibilities.

1.6 INSPECTIONS

A. Inspections shall be performed by a qualified Inspector and/or approved Testing Agency, acceptable to the Building Official.

1. Contractor shall be responsible to notify Inspector in a timely manner when required inspections need to be performed.

B. The Inspection/Testing firm shall be responsible for immediately notifying in writing the Owner, Construction Manager and Building Officials of all failed inspections and/or tests. The Architect and Contractor will be notified by the Construction Manager.

1.7 SCHEDULE OF INSPECTIONS AND TESTS

A. Required inspections and tests are described in the "Statement of Inspections" attached at the end of this section and in the individual specification sections for the items to be inspected or tested.

1.8 QUALIFICATIONS

A. The Testing Firm and individual technicians shall be approved by the Building Official.

B. The Testing Firm shall maintain a full-time licensed Professional Engineer (P.E.) on staff who shall certify the test reports. The Engineer shall be responsible for the training of the testing technicians and shall be in responsible charge of the field and laboratory testing operations.

C. Inspections shall be performed by inspectors as indicated below:

1. Inspections of soils may be performed by inspectors with an education and background in geotechnical engineering.
2. Technicians performing sampling and testing of concrete shall be an ACI certified "Concrete Field Testing Technician - Grade 1".
3. Inspectors performing inspections of concrete work, such as inspections of concrete placement, batching, reinforcing, curing and protection, shall be an ICC certified "Reinforced Concrete Inspector".
4. Technicians performing standard tests described by specific ASTM Standards shall have training in the performance of such tests and must be able to demonstrate, either by oral or written examination, competence for the test to be conducted. They shall be under the supervision of a licensed Professional Engineer and shall not be permitted to independently evaluate test results.

1.9 SUBMITTALS

A. The Inspector shall submit to the Owner and Building Official for review a copy of their qualifications which shall include the names and qualifications of each of the individual inspectors and technicians who will be performing inspections or tests.

B. The Inspector shall disclose any past or present business relationship or potential conflict of interest with the Contractor or any of the Subcontractors whose work will be inspected or tested.

1.10 PAYMENT

A. The Owner shall engage and pay for the services of the Inspector and Agents of the Inspector.

B. If any materials which require Inspections are fabricated in a plant which is not located within 100 miles of the project, the Contractor shall be responsible for the travel expenses of the Inspector or Testing Firm.

1. Expenses shall be adequate to provide same-day round-trip transportation to remote plant.
2. Expenses shall include travel, lodging and meals.

C. The Contractor shall be responsible for the cost of any retesting or re-inspection of work which fails to comply with the requirements of the Contract Documents.

1.11 CONTRACTOR RESPONSIBILITIES

A. Contractor's Statement of Responsibility: Each Contractor responsible for the construction of a seismic force resisting system, designated seismic system or components listed in the Seismic Quality Assurance Plan shall submit a "Contractor's Statement of Responsibility", attached at the end of this section, to the Building Official and the Owner prior to the commencement of work. The Contractor's statement of responsibility contains the following:

1. Acknowledgement of awareness of the project's inspection requirements.
2. Acknowledgement that control will be exercised to obtain conformance with the construction documents approved by the Building Official.
3. Procedures for exercising control within the Contractor's organization, the method and frequency of reporting and the distribution of the reports.
4. Identification and qualifications of the person(s) exercising such control and their positions(s) in the organization.

B. The Contractor shall cooperate with the Inspector and his agents so that the Inspections and Testing may be performed without hindrance.

C. The Contractor shall review the "Statement of Inspections" and shall be responsible for coordinating and scheduling inspections and tests. The Contractor shall notify the Inspector or Testing Laboratory at least 48 hours in advance of a required inspection or test. Un-inspected work that required inspection may be rejected solely on that basis.

D. The Contractor shall provide incidental labor and facilities to provide access to the work to be inspected or tested, to obtain and handle samples at the site or at the source of products to be tested, and to facilitate tests and inspection, storage and curing of test samples.

E. The Contractor shall keep at the project site the latest set of construction drawings, field sketches, approved and field use shop and erection drawings, and specifications for use by the Inspectors and Testing technicians.

F. The Inspections program shall in no way relieve the Contractor of his obligation to perform work in accordance with the requirements of the Contract Documents or from implementing an effective Quality Control Program. All work that is to be subjected to Inspections shall first be reviewed by the Contractor's Quality Control personnel.

G. The Contractor shall be solely responsible for construction site safety.

1.12 LIMITS ON AUTHORITY

A. The Inspector may not release, revoke, alter or enlarge on the requirements of the Contract Documents.

B. The Inspector will not have control over the Contractor's means and methods of construction.

C. The Inspector shall not be responsible for construction site safety.

D. The Inspector has no authority to stop the work.

1.13 RECORDS AND REPORTS

A. Detailed daily reports shall be prepared of each inspection by the Inspector. Reports shall include:

1. Date of test or inspection
2. Name of Inspector or Technician
3. Location of specific areas tested or inspected
4. Description of test or inspection and results
5. Applicable ASTM standard
6. Weather conditions
7. Engineer's seal and signature

B. The Inspector shall submit interim reports to the Owner, Architect, Construction Manager and Building Official at the end of each week which includes all inspections and test reports received that week. Copies shall be sent to the Architect and Contractor.

C. Any discrepancies from the Contract Documents found during an Inspection shall be immediately reported to the Architect, Construction Manager, Contractor and Owner. If the discrepancies are not corrected, the Inspector shall notify the Owner, Architect, Construction Manager and Building Official. Reports shall document all discrepancies identified and the corrective action taken.

D. The Testing Firm shall immediately notify the Owner, Architect, Construction Manager and Building Official by telephone, fax or email of any test results which fail to comply with the requirements of the Contract Documents.

E. At the completion of the work requiring Inspections, each Inspection Agency and/or Testing Firm shall provide a statement to the Owner, Architect, Construction Manager and Building Official that all work was completed in substantial conformance with the Contract Documents and that all appropriate inspections and tests were performed.

1.14 FINAL REPORT OF REQUIRED INSPECTIONS

A. The "Final Report of Inspections" shall be completed by the Inspector and submitted to the Owner, Architect, Construction Manager and Building Official prior to the issuance of a "Certificate of Use and Occupancy".

B. The "Final Report of Inspections" will certify that all required inspections have been performed and will itemize any discrepancies that were not corrected or resolved.

PART 2 - PRODUCTS

2.1 Not Required

PART 3 - EXECUTION

3.1 Not Required

END OF SECTION 01 45 10

"STATEMENT OF INSPECTIONS"

SCHEDULE OF REQUIRED INSPECTIONS – CHAPTER 1

MATERIAL	TYPE OF INSPECTION	AREA/ BLDG	SPEC. SECTION
S406.6.6 Inspection of fill.	Placement of the fill material shall be inspected by the code official.	Site	312000

SCHEDULE OF REQUIRED INSPECTIONS – CHAPTER 17

Instructions

The inspection requirements shall be based on Chapter 17 of the 2009 International Building Code. Any deviations from the requirements of Section 1704 must be approved by Office of State Engineer. If Inspection is by "Other", the inspecting entity shall be identified.

MATERIALS	TYPE OF INSPECTION	SPECIFICATION REFERENCE	INSPECTION BY:		
			Arch.	Eng.	Other
Concrete	Rebar Placement (Periodic)	31713, par. 3.3			X
	Verify Use of Design Mix (Periodic)	31713, par. 3.11 And 321313, par. 3.13			X
	Sample Slump, Air, Temperature (Cont)	31713, par. 3.11 And 321313, par. 3.13			X
	Concrete Placement (Cont)	31713, par. 3.11 And 321313, par. 3.13			X
	Curing (Periodic)	31713, par. 3.11 And 321313, par. 3.13			X
	Verification of In-Situ Strength (Periodic)	31713, par. 3.11 And 321313, par. 3.13			X

SECTION 01 50 00 – TEMPORARY FACILITIES AND CONTROLS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes requirements for temporary facilities and controls, including temporary utilities, support facilities, and security and protection facilities.

B. Temporary utilities include, but are not limited to, the following:
1. Sewers and drainage.
2. Water service and distribution.
3. Sanitary facilities, including toilets, wash facilities, and drinking-water facilities.
4. Electric power service (as necessary).
5. Lighting (as necessary).
6. Telephone service (as necessary).

C. Support facilities include, but are not limited to, the following:
1. Dewatering facilities and drains.
2. Project identification and temporary signs.
3. Waste disposal facilities.
4. Field offices.
5. Storage and fabrication sheds.
6. Construction aids and miscellaneous services and facilities.

D. Security and protection facilities include, but are not limited to, the following:
1. Environmental protection.
2. Stormwater control.
3. Tree and plant protection.
4. Pest control.
5. Site enclosure fence (requested or necessary modifications).
6. Security enclosure and lockup.
7. Barricades, warning signs, and lights.
8. Covered walkways.
9. Temporary enclosures.
10. Fire protection.

1.3 USE CHARGES

A. General: Cost or use charges for temporary facilities are not chargeable to Owner or Architect and shall be included in the Contract Sum. Allow other entities to use temporary services and facilities without cost, including, but not limited to, the following:
1. Owner's internal construction forces.
2. Architect.
3. Testing agencies.
4. Personnel of authorities having jurisdiction.

B. Sewer Service: Pay sewer service use charges for sewer usage, by all parties engaged in construction, at Project site.

C. Water Service: The Owner's existing water service facilities shall not be used. Arrange for, provide connections and pay for water service used. Remove temporary connections when no longer needed.

D. Electric Power Service: The Owner's existing electric service facilities shall not be used. Arrange for, provide connections and pay for electric service used. Remove temporary connections when no longer needed.

1.4 SUBMITTALS

A. Temporary Utility Reports: Submit reports of tests, inspections, meter readings, and similar procedures performed on temporary utilities.

1.5 QUALITY ASSURANCE

A. Standards: Comply with ANSI A10.6, NECA's "Temporary Electrical Facilities," and NFPA 241.
   1. Electric Service: Comply with NECA, NEMA, and UL standards and regulations for temporary electric service. Install service to comply with NFPA 70.

B. Tests and Inspections: Arrange for authorities having jurisdiction to test and inspect each temporary utility before use. Obtain required certifications and permits.

1.6 PROJECT CONDITIONS

A. Conditions of Use: The following conditions apply to use of temporary services and facilities by all parties engaged in the Work:
   1. Keep temporary services and facilities clean and neat.
   2. Relocate temporary services and facilities as required by progress of the Work.

PART 2 - PRODUCTS

2.1 MATERIALS

A. General: Provide new materials. Undamaged, previously used materials in serviceable condition may be used if approved by Architect. Provide materials suitable for use intended.

B. Chain-Link Fencing: The Owner has provided limited construction site fencing as indicated on drawings. For additional fencing needed by the contractor, utilize minimum 2-inch, 0.148-inch-thick, galvanized steel, chain-link fabric fencing; minimum 8 feet high with galvanized steel pipe posts and concrete footers, or panel type fencing. Screening material to match existing screening material on Owner fencing. Note that other trades will be onsite during the work of this package and all trades will share the lay-down area indicated on the drawings. Coordinate all use with the Construction Manager.

C. Lumber and Plywood: Comply with requirements in Division 6 Section "Miscellaneous Carpentry."

D. Tarpaulins: Fire-resistive labeled with flame-spread rating of 15 or less.

E. Water: Potable.

2.2 EQUIPMENT

A. General: Provide equipment suitable for use intended.

B. Field Offices: Mobile or prefabricated units with lockable entrances, operable windows, and serviceable finishes; heated and air conditioned; on foundations adequate for normal loading.

C. Fire Extinguishers: Hand carried, portable, UL rated. Provide class and extinguishing agent as indicated or a combination of extinguishers of NFPA-recommended classes for exposures.
   1. Comply with NFPA 10 and NFPA 241 for classification, extinguishing agent, and size required by location and class of fire exposure.

D. Self-Contained Toilet Units: Single-occupant units of chemical, aerated re-circulation, or combustion type; vented; fully enclosed with a glass-fiber-reinforced polyester shell or similar nonabsorbent material.

E. Drinking-Water Fixtures: Containerized, bottled-water drinking-water units, including paper cup supply.

F. Electrical Outlets: Properly configured, NEMA-polarized outlets to prevent insertion of 110- to 120-V plugs into higher-voltage outlets; equipped with ground-fault circuit interrupters, reset button, and pilot light.

G. Power Distribution System Circuits: Where permitted and overhead and exposed for surveillance, wiring circuits, not exceeding 125-V ac, 20-A rating, and lighting circuits may be nonmetallic sheathed cable.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

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

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

3.2 TEMPORARY UTILITY INSTALLATION

A. General: Engage appropriate local utility company to install temporary service or connect to existing service. Where utility company provides only part of the service, provide the remainder with matching, compatible materials and equipment. Comply with utility company recommendations.
   1. Arrange with utility company, Owner, and existing users for time when service can be interrupted, if necessary, to make connections for temporary services.

2. Provide adequate capacity at each stage of construction. Before temporary utility is available, provide trucked-in services.
3. Obtain easements to bring temporary utilities to Project site where Owner's easements cannot be used for that purpose.

B. Sewers and Drainage: If sewers are available, provide temporary connections to remove effluent that can be discharged lawfully. If sewers are not available or cannot be used, provide drainage ditches, dry wells, stabilization ponds, and similar facilities. If neither sewers nor drainage facilities can be lawfully used for discharge of effluent, provide containers to remove and dispose of effluent off-site in a lawful manner.
1. Filter out excessive soil, construction debris, chemicals, oils, and similar contaminants that might clog sewers or pollute waterways before discharge.
2. Maintain temporary sewers and drainage facilities in a clean, sanitary condition. After heavy use, restore normal conditions promptly.

C. Water Service: The Owner's existing water service facilities shall not be used. Arrange for, provide connections, and pay for water service used. Remove temporary connections when no longer needed.
1. Provide rubber hoses as necessary to serve Project site.

D. Sanitary Facilities: None of the sanitary facilities in the Owner's buildings will be available for use by construction personnel. Provide temporary toilets, wash facilities, and drinking-water fixtures. Comply with regulations and health codes for type, number, location, operation, and maintenance of fixtures and facilities.
1. Disposable Supplies: Provide toilet tissue, paper towels, paper cups, and similar disposable materials for each facility. Maintain adequate supply. Provide covered waste containers for disposal of used material.
2. Toilets: Install self-contained toilet units. Shield toilets to ensure privacy.
3. Wash Facilities: Install wash facilities supplied with potable water at convenient locations for personnel who handle materials that require wash up. Dispose of drainage properly. Supply cleaning compounds appropriate for each type of material handled.
4. Drinking-Water Facilities: Provide bottled-water, drinking-water units.

E. Electric Power Service: The Owner's existing electric service facilities shall not be used. Arrange for, provide connections and pay for electric service used. Remove temporary connections when no longer needed.

F. Electric Distribution: Electrical service shall be adequate for the work of all trades, except field welding, and shall be terminated in fused safety switch and circuit breaker distribution panels. Provide receptacle outlets adequate for connection of power tools and equipment.
1. Provide waterproof connectors to connect separate lengths of electrical power cords if single lengths will not reach areas where construction activities are in progress. Do not exceed safe length-voltage ratio.
2. Provide warning signs at power outlets other than 110 to 120 V.
3. Provide metal conduit, tubing, or metallic cable for wiring exposed to possible damage. Provide rigid steel conduits for wiring exposed on grades or other traffic areas.
4. Provide metal conduit enclosures or boxes for wiring devices.

G. Lighting: Provide temporary lighting that provides adequate illumination for construction operations and traffic conditions.

H. Telephone Service: Provide temporary telephone service throughout construction period for common-use facilities for all company personnel engaged in construction activities. Install separate telephone lines for each field office and first-aid station.
1. Provide additional telephone lines for the following:

a. Provide a dedicated telephone line for each facsimile machine and computer with modem in each field office.

2. At each telephone, post a list of important telephone numbers.
   a. Police and fire departments.
   b. Ambulance service.
   c. Contractor's home office.
   d. Architect's office.
   e. Consultants' offices.
   f. Owner's office.
   g. Principal subcontractors' field and home offices.
3. Provide answering machine or messaging service on superintendent's telephone 24 hours per day, seven days per week, holidays included.
4. Furnish superintendent with electronic voice communication device for use when away from field office.

3.3 SUPPORT FACILITIES INSTALLATION

A. General: Space for storage, and other support facilities will be available for use in the general proximity to the project site.
   1. Locate field offices, storage sheds, sanitary facilities, and other temporary construction and support facilities for easy access and as directed by Owner.
   2. Provide incombustible construction for offices, shops, and sheds located within construction area or within 30 feet of building lines. Comply with NFPA 241.

B. Dewatering Facilities and Drains: Comply with requirements in applicable Division 31 Sections for temporary drainage and dewatering facilities and operations not directly associated with construction activities included in individual Sections. Where feasible, use same facilities. Maintain Project site, excavations, and construction free of water.
   1. Remove snow and ice as required to minimize accumulations.

C. Project Identification and Temporary Signs: Provide project identification signs per Architect's design, and temporary information and direction signs as required and approved.
   1. No other signs will be permitted unless approved by Owner.
   2. Sign faces shall be 3/4" exterior grade, medium density overlay plywood unless otherwise indicated.
   3. Signs shall comply with all applicable code requirements and regulations.
   4. Project identification signs (two [2] required) shall be 4 feet by 8 feet with top of sign 9 feet above grade. Provide three (3) pressure treated 6"x6" wood posts imbedded 4 feet into 2 feet diameter by 5 feet deep concrete footings. Provide four (4) pressure treated 2"x4" studs mounted horizontally across posts to support face of sign.
   5. Paint sign panel and applied graphics with exterior-grade alkyd gloss enamel over exterior primer. Engage an experienced sign painter to apply graphics for Project identification and temporary signs.
   6. Prepare temporary signs to provide directional information to construction personnel and visitors.
   7. Erect signs at locations as directed

D. Waste Disposal Facilities: Provide waste-collection containers in sizes adequate to handle waste from construction operations. Containerize and clearly label hazardous, dangerous, or unsanitary waste materials separately from other waste. Comply with Division 1 Section "Execution Requirements" for progress cleaning requirements.
   1. If required by authorities having jurisdiction, provide separate containers, clearly labeled, for each type of waste material to be deposited.

2. Develop a waste management plan for Work performed on Project. Indicate types of waste materials Project will produce and track quantities of each type. Provide information on destination of each type of waste material and means to be used to dispose of all waste materials.

E. Contractor's Field Office: Provide an insulated, weather-tight, heated and air-conditioned field office for use by all personnel engaged in construction activities; of sufficient size to accommodate Contractor's required office personnel and meetings of 20 persons at Project site. Keep office clean and orderly.
   1. Furnish and equip office as follows:
      a. Office Furnishings: Contractor's option
   2. Provide a room of not less than 300 sq. ft. for Project meetings. Furnish room with conference table, 20 folding chairs, and 6 foot by 4 foot tack board and a 5 foot by 3 foot white marker board.
   3. Provide a telephone answering machine and plain paper facsimile machine, both to remain on-line 24 hours per day, 7 days per week including all holidays.
   4. Provide minimum of one (1) high speed copy machine with automatic feed, collating and enlargement/reduction capability.

F. Storage and Fabrication Sheds: Provide sheds sized, furnished, and equipped to accommodate materials and equipment involved, including temporary utility services. Sheds may be open shelters or fully enclosed spaces within building or elsewhere on-site.

3.4 SECURITY AND PROTECTION FACILITIES INSTALLATION

A. Environmental Protection: Provide protection, operate temporary facilities, and conduct construction in ways and by methods that comply with environmental regulations and that minimize possible air, waterway, and subsoil contamination or pollution or other undesirable effects. Avoid using tools and equipment that produce harmful noise. Restrict use of noisemaking tools and equipment to hours that will minimize complaints from persons or firms near Project site.

B. Stormwater Control: Provide earthen embankments and similar barriers in and around excavations and subgrade construction, sufficient to prevent flooding by runoff of stormwater from heavy rains.

C. Tree and Plant Protection: Install temporary fencing located as indicated or outside the drip line of trees to protect vegetation from construction damage. Protect tree root systems from damage, flooding, and erosion.

D. Site Enclosure Fence: The Owner has provided for limited site enclosure fencing as indicated on the drawings. The contractor is responsible for any additional required fencing, or relocation or repair of Owner provided fencing. When excavation begins, install additional chain-link enclosure fence with lockable entrance gates sufficient to completely secure work areas. Locate where indicated, or enclose entire Project site or portion determined sufficient to accommodate construction operations. Install in a manner that will prevent people, dogs, and other animals from easily entering site except by entrance gates.
   1. Maintain security by limiting number of keys and restricting distribution to authorized personnel. Provide Owner with three sets of keys.

E. Security Enclosure and Lockup: Install substantial temporary enclosure around partially completed areas of construction as necessary. Provide lockable entrances to prevent unauthorized entrance, vandalism, theft, and similar violations of security.

1. The Owner assumes no responsibility for loss, theft, or damage to the work, tools, equipment, and construction. In the instance of any such loss, theft, or damage, the Contractor shall be responsible to renew, restore, or remedy the work, tools, equipment, and construction in accordance with requirements of the Contract Documents without additional cost to the Owner.
2. Site parked equipment, operable machinery, and hazardous parts of the new construction subject to mischief and accidental operation shall be inaccessible, locked, or otherwise made inoperable when left unattended.

F. Barricades, Warning Signs, and Lights: Comply with standards and code requirements for erecting structurally adequate barricades. Paint with appropriate colors, graphics, and warning signs to inform personnel and public of possible hazard. Where appropriate and needed, provide lighting, including flashing red or amber lights.

G. Covered Walkway: If any portion of the work will be immediately adjacent to pedestrian walkways, erect a structurally adequate, protective, covered walkway for passage of persons accessing and leaving adjacent existing facilities. Coordinate with entrance gates, other facilities, and obstructions. Comply with regulations of authorities having jurisdiction. Maintain required egress from facilities affected by construction operations.
1. Construct covered walkways using scaffold or shoring framing.
2. Provide wood-plank overhead decking, protective plywood enclosure walls, handrails, barricades, warning signs, lights, safe and well-drained walkways, and similar provisions for protection and safe passage.
3. Paint and maintain in a manner approved by Owner and Architect.
4. For safety barriers, sidewalk bridges, and similar uses, provide minimum 5/8-inch- thick exterior plywood. Barricades must be 8 feet high as per 2009 IBC section 3306, table 3306.1.

H. Temporary Fire Protection: Install and maintain temporary fire-protection facilities of types needed to protect against reasonably predictable and controllable fire losses. Comply with NFPA 241.
1. Provide fire extinguishers visible and accessible from space being served, with sign mounted above.
   a. Field Offices: Class A stored-pressure water-type extinguishers.
   b. Other Locations: Class ABC dry-chemical extinguishers or a combination of extinguishers of NFPA-recommended classes for exposures.
   c. Locate fire extinguishers where convenient and effective for their intended purpose.
2. Store combustible materials in containers in fire-safe locations.
3. Maintain unobstructed access to fire extinguishers, fire hydrants, temporary fire-protection facilities, and other access routes for firefighting.
4. Supervise welding operations and similar sources of fire ignition.
5. Develop and supervise an overall fire-prevention and first-aid fire-protection program for personnel at Project site. Review needs with local fire department and establish procedures to be followed. Instruct personnel in methods and procedures. Post warnings and information.
6. Extend existing fire department connections at adjacent existing buildings to locations accessible to emergency vehicles.

3.5 OPERATION, TERMINATION, AND REMOVAL

A. Supervision: Enforce strict discipline in use of temporary facilities. To minimize waste and abuse, limit availability of temporary facilities to essential and intended uses.

B. Maintenance: Maintain facilities in good operating condition until removal. Protect from damage caused by freezing temperatures and similar elements.
   1. Prevent water-filled piping from freezing. Maintain markers for underground lines. Protect from damage during excavation operations.

C. Termination and Removal: Remove each temporary facility when need for its service has ended, when it has been replaced by authorized use of a permanent facility, or no later than Substantial Completion. Complete or, if necessary, restore permanent construction that may have been delayed because of interference with temporary facility. Repair damaged Work, clean exposed surfaces, and replace construction that cannot be satisfactorily repaired.
   1. Remove temporary paving not intended for or acceptable for integration into permanent paving. Where area is intended for landscape development, remove soil and aggregate fill that do not comply with requirements for fill or subsoil. Remove materials contaminated with road oil, asphalt and other petrochemical compounds, and other substances that might impair growth of plant materials or lawns. Repair or replace street paving, curbs, and sidewalks at temporary entrances, as required by authorities having jurisdiction.
   2. At Substantial Completion, clean and renovate permanent facilities used during construction period. Comply with final cleaning requirements in Division 1 Section "Closeout Procedures."

END OF SECTION 01 50 00

SECTION 01 56 50 – ENVIRONMENTAL CONTROLS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes requirements for environmental controls in addition to those specified in other Sections.

1.3 DUST AND DIRT

A. Perform the Work in a manner to minimize the generation of dust and dirt, to prevent dust and dirt from interfering with the progress of the Work, and to keep dust and dirt from accumulating in Work areas and adjacent areas.

B. Sprinkle demolition areas with water continually during demolition activity; sprinkle unpaved construction areas with water at least twice per day to reduce dust generation by approximately fifty percent (50%); cover stockpiles of soil, sand and other materials; cover trucks hauling debris, soils, sand or other such material; and sweep streets surrounding demolition and construction sites at least once per day to reduce particulate emissions.

C. Contractor to prepare and submit for approval, a dust and dirt containment plan prior to beginning any work.

D. Contractor is responsible for all required sediment and erosion control as indicated on the drawings.

1.4 POLLUTION

A. No burning of refuse, debris or other materials shall occur on or in the vicinity of the Project site. Comply with applicable regulatory requirements and anti-pollution ordinances during the conduct of construction and disposal operations.

B. Prevent toxic concentrations of chemicals.

C. Provide methods, means and facilities to prevent contamination of soil, water and atmosphere by the discharge of noxious substances from demolition and construction operations. Remove and legally dispose of soil contaminated by the performance of the Work, and replace with good soil at no expense to the Owner.

D. Provide systems for control of atmospheric pollutants.

E. Prevent harmful dispersal of pollutants into the atmosphere.

F. Maintain and operate construction equipment to maximize exhaust emissions of particulate and other pollutants, such as by prohibiting idling motors when equipment is not in use or when trucks are waiting in queues, or implementing specific maintenance programs to reduce emissions from equipment that would be in frequent use for much of the demolition and construction periods.

G. Contractor to prepare pollution containment plan and submit for review and approval prior to start of work.

1.5 NOISE CONTROL

A. The City will limit hours of certain types of demolition and construction operations; coordinate with the City.

B. Muffle and shield intakes and exhausts, shroud or shield impact tools, and use electric-powered rather than diesel-powered construction equipment, as feasible, or as directed by the City.

C. Predrill holes for piles to the maximum feasible depth, in order to minimize noise and vibration from pile driving. Consult with the Department of Public Works to determine the time when pile driving would cause the least disturbance of neighboring uses.

D. Contractor to prepare noise control plan and submit for review and approval prior to start or work.

E. All work shall conform to requirements of the City.

1.6 WATER CONTROL

A. Do not permit surface and subsurface water and other liquids to accumulate in or about the Project site and vicinity thereof. Should conditions develop, control the water or other liquids, and suitably dispose of by means of temporary pumps, piping, drainage lines, troughs, ditches, dams or other methods.

PART 2 - PRODUCTS

(Not Used)

PART 3 - EXECUTION

(Not Used)

END OF SECTION 01 56 50

SECTION 01 60 00 – PRODUCT REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following administrative and procedural requirements: selection of products for use in Project; product delivery, storage, and handling; manufacturers' standard warranties on products; special warranties; product substitutions; and comparable products.

1.3 DEFINITIONS

A. Products: Items for incorporation in the Work, whether purchased for Project, taken from previously purchased stock, or reused from Owner's prior Project. The term "product" includes the terms "material", "equipment," "system," and similar terms.

1. Named Products: Items identified by manufacturer's product name, including make or model number or other designation, shown or listed in manufacturer's published product literature that is current as of date of the Contract Documents. New Products: Items that have not previously been incorporated into another project or facility, except that products consisting of recycled-content materials are allowed, unless explicitly stated otherwise
2. Comparable Product: Product that is demonstrated and approved through submittal process, or where indicated as a product substitution, to have the indicated qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics that equal or exceed those of specified product.

B. Substitutions: Changes in products, materials, equipment, and methods of construction from those required by the Contract Documents which are proposed by Contractor.

C. Basis-of-Design Product Specification: Where a specific manufacturer's product is named and accompanied by the words "basis of design," including make or model number or other designation, to establish the significant qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics for purposes of evaluating comparable products of other named manufacturers.

D. Manufacturer's Warranty: Preprinted written warranty published by individual manufacturer for a particular product and specifically endorsed by manufacturer to Owner.

E. Special Warranty: Written warranty required by or incorporated into the Contract Documents, either to extend time limit provided by manufacturer's warranty or to provide more rights for Owner.

1.4 SUBMITTALS

A. Product List: Submit a list, in tabular from, showing specified products. Include generic names of products required. Include manufacturer's name and proprietary product names for each product.

1. Coordinate product list with Contractor's Construction Schedule and the Submittals Schedule.
2. Form: Tabulate information for each product under the following column headings:

a. Specification Section number and title.
b. Generic name used in the Contract Documents.
c. Proprietary name, model number, and similar designations.
d. Manufacturer's name and address.
e. Identification of items that require early submittal approval for scheduled delivery date.

3. Initial Submittal: Within 30 days after date of commencement of the Work, submit 3 copies of initial product list. Include a written explanation for omissions of data and for variations from Contract requirements.

a. At Contractor's option, initial submittal may be limited to product selections and designations that must be established early in Contract period.

4. Completed List: Within 60 days after date of commencement of the Work, submit 3 copies of completed product list. Include a written explanation for omissions of data and for variations from Contract requirements.
5. Architect's Action: Architect will respond in writing to Contractor within 15 days of receipt of completed product list. Architect's response will include a list of unacceptable product selections and a brief explanation of reasons for this action. Architect's response, or lack of response, does not constitute a waiver of requirement that products comply with the Contract Documents.

B. Substitution Requests: Submit three copies of each request for consideration. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.

1. Documentation: Show compliance with requirements for substitutions and the following, as applicable:

a. Statement indicating why specified material or product cannot be provided.
b. Coordination information, including a list of changes or modifications needed to other parts of the Work and to construction performed by Owner and separate contractors that will be necessary to accommodate proposed substitution.
c. Detailed comparison of significant qualities of proposed substitution with those of the Work specified. Significant qualities may include attributes such as performance, weight, size, durability, visual effect, and specific features and requirements indicated.
d. Product Data, including drawings and descriptions of products and fabrication and installation procedures.
e. Samples, where applicable or requested.
f. List of similar installations for completed projects with project names and addresses and names and addresses of architects and owners.
g. Material test reports from a qualified testing agency indicating and interpreting test results for compliance with requirements indicated.

h. Detailed comparison of Contractor's Construction Schedule using proposed substitution with products specified for the Work, including effect on the overall Contract Time. If specified product or method of construction cannot be provided within the Contract Time, include letter from manufacturer, on manufacturer's letterhead, stating lack of availability or delays in delivery.
i. Cost information, including a proposal of change, if any, in the Contract Sum.
j. Contractor's certification that proposed substitution complies with requirements in the Contract Documents and is appropriate for applications indicated.
k. Contractor's waiver of rights to additional payment or time that may subsequently become necessary because of failure of proposed substitution to produce indicated results.

2. Architect's Action: If necessary, Architect will request additional information or documentation for evaluation within one week of receipt of a request for substitution. Architect will notify Contractor of acceptance or rejection of proposed substitution within 15 days of receipt of request, or 7 days of receipt of additional information or documentation, whichever is later.

a. Form of Acceptance: Change Order.
b. Use product specified if Architect cannot make a decision on use of a proposed substitution within time allocated.

C. Basis-of-Design Product Specification Submittal: Comply with requirements in Division 1 Section "Submittal Procedures." Show compliance with requirements.

1.5 QUALITY ASSURANCE

A. Compatibility of Options: If Contractor is given option of selecting between two or more products for use on Project, product selected shall be compatible with products previously selected, even if previously selected products were also options.

1.6 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, and handle products using means and methods that will prevent damage, deterioration, and loss, including theft. Comply with manufacturer's written instructions.

1. Schedule delivery to minimize long-term storage at Project site and to prevent overcrowding of construction spaces.
2. Coordinate delivery with installation time to ensure minimum holding time for items that are flammable, hazardous, easily damaged, or sensitive to deterioration, theft, and other losses.
3. Deliver products to Project site in an undamaged condition in manufacturer's original sealed container or other packaging system, complete with labels and instructions for handling, storing, unpacking, protecting, and installing.
4. Inspect products on delivery to ensure compliance with the Contract Documents and to ensure that products are undamaged and properly protected.
5. Store materials in a manner that will not endanger Project structure.
6. Store products that are subject to damage by the elements, under cover in a weathertight enclosure above ground, with ventilation adequate to prevent condensation.
7. Comply with product manufacturer's written instructions for temperature, humidity, ventilation, and weather-protection requirements for storage.
8. Protect stored products from damage.

1.7 PRODUCT WARRANTIES

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

B. Special Warranties: Prepare a written document that contains appropriate terms and identification, ready for execution. Submit a draft for approval before final execution.

1. Manufacturer's Standard Form: Modified to include Project-specific information and properly executed.
2. Specified Form: Forms are included with the Specifications. Prepare a written document using appropriate form properly executed.
3. Refer to Divisions 2 through 17 Sections for specific content requirements and particular requirements for submitting special warranties.

C. Submittal Time: Comply with requirements in Division 1 Section "Closeout Procedures."

PART 2 - PRODUCTS

2.1 PRODUCT OPTIONS

A. General Product Requirements: Provide products that comply with the Contract Documents, that are undamaged, and unless otherwise indicated, that are new at time of installation.

1. Provide products complete with accessories, trim, finish, fasteners, and other items needed for a complete installation and indicated use and effect.
2. Standard Products: If available, and unless custom products or nonstandard options are specified, provide standard products of types that have been produced and used successfully in similar situations on other projects.
3. Owner reserves the right to limit selection to products with warranties not in conflict with requirements of the Contract Documents.
4. Where products are accompanied by the term "as selected," Architect will make selection.
5. Where products are accompanied by the term "match sample," sample to be matched is Architect's.
6. Descriptive, performance, and reference standard requirements in the Specifications establish "salient characteristics" of products.
7. Or Equal: Where products are specified by name and accompanied by the term "or equal" or "or approved equal" or "or approved," comply with provisions in "Comparable Products" Article to obtain approval for use of an unnamed product.

B. Product Selection Procedures:

1. Product: Where Specification paragraphs or subparagraphs titled "Product" name a single product and manufacturer, provide the product named.
2. Manufacturer/Source: Where Specification paragraphs or subparagraphs titled "Manufacturer" or "Source" name single manufacturers or sources, provide a product by the manufacturer or from the source named that complies with requirements.
3. Products: Where Specification paragraphs or subparagraphs titled "Products" introduce a list of names of both products and manufacturers, provide one of the products listed that complies with requirements.

4. Manufacturers: Where Specification paragraphs or subparagraphs titled "Manufacturers" introduce a list of manufacturers' names, provide a product by one of the manufacturers listed that complies with requirements.
5. Acceptable Products: Where Specification paragraphs or subparagraphs titled "Acceptable Products" introduce a list of names of both products and manufacturers, provide one of the products listed or another product that complies with requirements. Comply with provisions in "Comparable Products" Article to obtain approval for use of an unnamed product.
6. Acceptable Manufacturers: Where Specification paragraphs or subparagraphs titled "Acceptable Manufacturers" introduce a list of manufacturers' names, provide a product by one of the manufacturers listed or another manufacturer that complies with requirements. Comply with provisions in "Comparable Products" Article to obtain approval for use of an unnamed product.
7. Product Options: Where Specification paragraphs titled "Product Options" indicate that size, profiles, and dimensional requirements on Drawings are based on a specific product or system, provide either the specific product or system indicated or a comparable product or system by another manufacturer. Comply with provisions in "Product Substitutions" Article.
8. Basis-of-Design Products: Where Specification paragraphs or subparagraphs titled "Basis-of-Design Products" are included and also introduce or refer to a list of manufacturers' names, provide either the specified product or a comparable product by one of the other named manufacturers. Drawings and Specifications indicate sizes, profiles, dimensions, and other characteristics that are based on the product named. Comply with provisions in "Comparable Products" Article to obtain approval for use of an unnamed product.
9. Visual Matching Specification: Where Specifications require matching an established Sample, select a product (and manufacturer) that complies with requirements and matches Architect's sample. Architect's decision will be final on whether a proposed product matches satisfactorily.

    a. If no product available within specified category matches satisfactorily and complies with other specified requirements, comply with provisions of the Contract Documents on "substitutions" for selection of a matching product.

10. Visual Selection Specification: Where Specifications include the phrase "as selected from manufacturer's colors, patterns, textures" or a similar phrase, select a product (and manufacturer) that complies with other specified requirements.

    a. Standard Range: Where Specifications include the phrase "standard range of colors, patterns, textures" or similar phrase, Architect will select color, pattern, or texture from manufacturer's product line that does not include premium items.
    b. Full Range: Where Specifications include the phrase "full range of colors, patterns, textures" or similar phrase, Architect will select color, pattern, or texture from manufacturer's product line that includes both standard and premium items.

2.2 PRODUCT SUBSTITUTIONS

A. Timing: Architect will consider requests for substitution if received within at least ten days prior to the receipt of bids. Requests received after that time may be considered or rejected at discretion of Architect.

B. Conditions: Architect will consider Contractor's request for substitution when the following conditions are satisfied. If the following conditions are not satisfied, Architect will return requests without action, except to record noncompliance with these requirements:

1. Requested substitution offers Owner a substantial advantage in cost, time, energy conservation, or other considerations, after deducting additional responsibilities Owner must assume. Owner's additional responsibilities may include compensation to Architect for redesign and evaluation services, increased cost of other construction by Owner, and similar considerations.
2. Requested substitution does not require extensive revisions to the Contract Documents.
3. Requested substitution is consistent with the Contract Documents and will produce indicated results.
4. Substitution request is fully documented and properly submitted.
5. Requested substitution will not adversely affect Contractor's Construction Schedule.
6. Requested substitution is compatible with other portions of the Work.
7. Requested substitution has been coordinated with other portions of the Work.
8. Requested substitution provides specified warranty.

2.3 COMPARABLE PRODUCTS

A. Where products or manufacturers are specified by name, submit the following, in addition to other required submittals, to obtain approval of an unnamed product:

1. Evidence that the proposed product does not require extensive revisions to the Contract Documents, that it is consistent with the Contract Documents and will produce the indicated results, and that it is compatible with other portions of the Work.
2. Detailed comparison of significant qualities of proposed product with those named in the Specifications. Significant qualities include attributes such as performance, weight, size, durability, visual effect, and specific features and requirements indicated.
3. Evidence that proposed product provides specified warranty.
4. List of similar installations for completed projects with project names and addresses and names and addresses of architects and owners, if requested.
5. Samples, if requested.

PART 3 - EXECUTION

(Not Used)

END OF SECTION 01 60 00

SECTION 01 70 00 – EXECUTION REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes general procedural requirements governing execution of the Work including, but not limited to, the following:
   1. Construction layout.
   2. Field engineering and surveying.
   3. General installation of products.
   4. Coordination of Owner-installed products.
   5. Progress cleaning.
   6. Starting and adjusting.
   7. Protection of installed construction.
   8. Correction of the Work.

1.3 SUBMITTALS

A. Qualification Data: For land surveyor to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.

B. Certificates: Submit certificate signed by land surveyor certifying that location and elevation of improvements comply with requirements.

C. Landfill Receipts: Submit copy of receipts issued by a landfill facility, licensed to accept hazardous materials, for hazardous waste disposal.

D. Final Property Survey: Submit 10 copies showing the Work performed and record survey data.

1.4 QUALITY ASSURANCE

A. Land Surveyor Qualifications: A professional land surveyor who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing land-surveying services of the kind indicated.

PART 2 - PRODUCTS

A. (Not Used)

PART 3 - EXECUTION

3.1 EXAMINATION

A. Existing Conditions: The existence and location of site improvements, utilities, and other construction indicated as existing are not guaranteed. Before beginning work, investigate and verify the existence and location of mechanical and electrical systems and other construction affecting the Work.
   1. Before construction, verify the location and points of connection of permanent and temporary utility and building services.
   2. Coordinate utility and building services connection locations with Owner.

B. Existing Utilities: The existence and location of underground and other utilities and construction indicated as existing are not guaranteed. Before beginning sitework, investigate and verify the existence and location of underground utilities and other construction affecting the Work.
   1. Before construction, verify the location and invert elevation at points of connection of sanitary sewer, storm sewer, and water-service piping; and underground electrical services.

C. Acceptance of Conditions: Examine substrates, areas, and conditions, with Installer or Applicator present where indicated, for compliance with requirements for installation tolerances and other conditions affecting performance. Record observations.

   1. Written Report: Where a written report listing conditions detrimental to performance of the Work is required by other Sections, include the following:
      a. Description of the Work.
      b. List of detrimental conditions, including substrates.
      c. List of unacceptable installation tolerances.
      d. Recommended corrections.
   2. Verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.
   3. Proceed with installation only after unsatisfactory conditions have been corrected. Proceeding with the Work indicates acceptance of surfaces and conditions.

3.2 PREPARATION

A. Existing Utility Information: Furnish information to local utility and Owner that is necessary to adjust, move, or relocate existing utility structures, utility poles, lines, services, or other utility appurtenances located in or affected by construction. Coordinate with authorities having jurisdiction.

B. Existing Utility and Building services Interruptions: Do not interrupt utilities or building services for facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:
   1. Notify Owner not less than one week in advance of proposed utility interruptions.
   2. Do not proceed with utility and building services interruptions without Owner's written permission.

C. Field Measurements: Take field measurements as required to fit the Work properly. Recheck measurements before installing each product. Where portions of the Work are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

D. Space Requirements: Verify space requirements and dimensions of items shown diagrammatically on Drawings.

E. Review of Contract Documents and Field Conditions: Immediately on discovery of the need for clarification of the Contract Documents, submit a request for information to Architect. Include a detailed description of problem encountered, together with recommendations for changing the Contract Documents.

3.3 CONSTRUCTION LAYOUT

A. Verification: Before proceeding to lay out the Work, verify layout information shown on Drawings, in relation to the property survey and existing benchmarks. If discrepancies are discovered, notify Architect promptly.

B. General: Engage a registered land surveyor to lay out the Work using accepted surveying practices.
   1. Establish benchmarks and control points to set lines and levels at each story of construction and elsewhere as needed to locate each element of Project.
   2. Establish dimensions within tolerances indicated. Do not scale Drawings to obtain required dimensions.
   3. Inform installers of lines and levels to which they must comply.
   4. Check the location, level and plumb, of every major element as the Work progresses.
   5. Notify Architect when deviations from required lines and levels exceed allowable tolerances.
   6. Close site surveys with an error of closure equal to or less than the standard established by authorities having jurisdiction.

C. Site Improvements: Locate and lay out site improvements, including pavements, grading, fill and topsoil placement, utility slopes, and invert elevations.

D. Building Lines and Levels: Locate and lay out control lines and levels for structures. Transfer survey markings and elevations for use with control lines and levels.

E. Record Log: Maintain a log of layout control work. Record deviations from required lines and levels. Include beginning and ending dates and times of surveys, weather conditions, name and duty of each survey party member, and types of instruments and tapes used. Make the log available for reference by Architect.

3.4 FIELD ENGINEERING

A. Reference Points: Locate existing permanent benchmarks, control points, and similar reference points before beginning the Work. Preserve and protect permanent benchmarks and control points during construction operations.
   1. Do not change or relocate existing benchmarks or control points without prior written approval of Architect. Report lost or destroyed permanent benchmarks or control points promptly. Report the need to relocate permanent benchmarks or control points to Architect before proceeding.
   2. Replace lost or destroyed permanent benchmarks and control points promptly. Base replacements on the original survey control points.

B. Benchmarks: Establish and maintain a minimum of two permanent benchmarks on Project site, referenced to data established by survey control points. Comply with authorities having jurisdiction for type and size of benchmark.

1. Record benchmark locations, with horizontal and vertical data, on Project Record Documents.

C. Final Property Survey: At the time of Substantial Completion, prepare a final property survey showing significant features (real property) for Project. Include on the survey a certification, signed by land surveyor, that principal metes, bounds, lines, and levels of Project are accurately positioned as shown on the survey.
   1. Show boundary lines, monuments, streets, site improvements and utilities, existing improvements and significant vegetation, adjoining properties, acreage, grade contours, and the distance and bearing from a site corner to a legal point.

3.5 INSTALLATION

A. General: Locate the Work and components of the Work accurately, in correct alignment and elevation, as indicated.
   1. Make vertical work plumb and make horizontal work level.
   2. Where space is limited, install components to maximize space available for maintenance and ease of removal for replacement.

B. Comply with manufacturer's written instructions and recommendations for installing products in applications indicated.

C. Install products at the time and under conditions that will ensure the best possible results. Maintain conditions required for product performance until Substantial Completion.

D. Conduct construction operations so no part of the Work is subjected to damaging operations or loading in excess of that expected during normal conditions of occupancy.

E. Tools and Equipment: Do not use tools or equipment that produce harmful noise levels.

F. Hazardous Materials: Use products, cleaners, and installation materials that are not considered hazardous.

3.6 PROGRESS CLEANING

A. General: Clean Project site and work areas daily, including common areas. Coordinate progress cleaning for joint-use areas where more than one installer has worked. Enforce requirements strictly. Dispose of materials lawfully.

   1. Comply with requirements in NFPA 241 for removal of combustible waste materials and debris.
   2. Do not hold materials more than 7 days during normal weather or 3 days if the temperature is expected to rise above 80 deg F.
   3. Containerize hazardous and unsanitary waste materials separately from other waste. Mark containers appropriately and dispose of legally, according to regulations.

B. Site: Maintain Project site free of waste materials and debris.

C. Work Areas: Clean areas where work is in progress to the level of cleanliness necessary for proper execution of the Work.

   1. Remove liquid spills promptly.

2. Where dust would impair proper execution of the Work, broom-clean the entire work area, as appropriate.

D. Installed Work: Keep installed work clean. Clean installed surfaces according to written instructions of manufacturer or fabricator of product installed, using only cleaning materials specifically recommended. If specific cleaning materials are not recommended, use cleaning materials that are not hazardous to health or property and that will not damage exposed surfaces.

E. Exposed Surfaces: Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.

F. Waste Disposal: Burying or burning waste materials on-site will not be permitted. Washing waste materials down sewers or into waterways will not be permitted.

G. During handling and installation, clean and protect construction in progress and adjoining materials already in place. Apply protective covering where required to ensure protection from damage or deterioration at Substantial Completion.

H. Clean and provide maintenance on completed construction as frequently as necessary through the remainder of the construction period.

I. Limiting Exposures: Supervise construction operations to assure that no part of the construction, completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period.

3.7 PROTECTION OF INSTALLED CONSTRUCTION

A. Provide final protection and maintain conditions that ensure installed Work is without damage or deterioration at time of Substantial Completion.

B. Comply with manufacturer's written instructions for temperature and relative humidity.

3.8 CORRECTION OF THE WORK

A. Repair or remove and replace defective construction. Restore damaged substrates and finishes. Comply with requirements in Division 1 Section "Cutting and Patching."

B. Restore permanent facilities used during construction to their specified condition.

C. Remove and replace damaged surfaces that are exposed to view if surfaces cannot be repaired without visible evidence of repair.

END OF SECTION 01 70 00

SECTION 01 73 01 – CUTTING AND PATCHING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes procedural requirements for cutting and patching.

1.3 DEFINITIONS

A. Cutting: Removal of existing construction necessary to permit installation or performance of other work.

B. Patching: The application, insertion, or projection of other products on, in or from a surface.

1. Patching shall achieve security, strength, weather protection, appearance for aesthetic match, all as applicable; efficiency, operational life, maintenance, and safety of operational elements; and shall preserve continuity of existing fire ratings.
2. Patching shall successfully duplicate undisturbed adjacent profiles, materials, textures, finishes and colors; materials shall match existing construction. Where there is dispute as to whether duplication is successful or has been achieved to a reasonable degree, the Architect's decision shall be final.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Materials shall be as specified in the individual Specification Sections and as required to match existing construction.

PART 3 - EXECUTION

3.1 GENERAL

A. Perform cutting, associated structural reinforcing, and patching in a manner to prevent damage to other Work and to provide proper surfaces for the installation of materials, equipment and repairs. Adjust and fit products to provide a neat installation.

B. Do not cut or alter structural members without prior consultation with the Architect.

C. Employ original installer or fabricator providing Work under this Contract to perform cutting and patching.

D. Adjust and fit products to provide a neat installation.

E. Finish or refinish, as applicable, cut and patched surfaces to match adjacent finishes.

END OF SECTION 01 73 01

SECTION 01 74 19 – CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for the following:

1. Salvaging nonhazardous construction waste.
2. Recycling nonhazardous construction waste.
3. Disposing of nonhazardous construction waste.

1.3 WASTE MANAGEMENT REQUIREMENTS

A. Owner requires that this project generate the least amount of trash and waste possible

B. Employ processes that ensure the generation of as little waste as possible due to error, poor planning, breakage, mishandling, contamination, or other factors

C. Minimize trash / waste disposal in landfills; reuse, salvage, or recycle as much waste as economically feasible.

D. Required Recycling, Salvage, and Reuse: The following may not be disposed of in landfills or by incinerations:

1. Aluminum and plastic beverage containers
2. Corrugated cardboard
3. Wood pallets and crates
4. Clean dimensional wood
5. Land clearing debris, including brush, branches, logs, and stumps: may be chipped and used as mulch as directed by the Landscape Architect or Civil Engineer or directed to other projects
6. Clay material on site to be used for making bricks for project: not included in early site development contract, but to be included in totals for overall project
7. Concrete: May be crushed and used as riprap, aggregate, sub-base material, or fill on this or other projects as approved. May not be used in structural fill areas. Use as sub-base material must be approved and must meet SCDOT gradation requirements
8. Bricks: May be used on other projects if whole, or crushed and used as landscape cover, sub-base material or fill on other projects where applicable
9. Concrete masonry units: May be used on other projects if whole, or crushed and used as landscape cover, sub-base material or fill on other projects as applicable
10. Metals, including packaging banding, sheet metal, structural steel, piping, conduit, reinforcing bars, and other items made of steel, iron, galvanized steel, stainless steel, aluminum, copper, zinc, lead, brass and bronze
11. Plastic buckets

12. Paper
13. Plastic sheeting and film

E. LEED Certification for this project is dependent on diversion of a minimum 75 percent, by weight, or potential landfill trash/waste by recycling and/or salvage

1. Salvage/Recycle Goals: Owner's goal is to reuse, salvage, and recycle as much nonhazardous demolition and construction waste as possible.

F. Contractor shall submit periodic Waste Disposal Reports; all landfill disposal, recycling, salvage, and reuse must be reported regardless of to whom the cost of saving accrues; use the same units of measure on all reports.

G. Contractor shall develop and follow a Waste Management Plan designed to implement these requirements.

H. Methods of trash/waste disposal that are not acceptable are:

1. Burning on the project site
2. Burying on the project site, except where crushed and approved by Architect to be reused as granular material
3. Dumping or burying on other property, public or private
4. Other illegal dumping or burying
5. Incineration, either on- or off-site

I. Regulatory Requirements: Contractor is responsible for knowing and complying with regulatory requirements, including but not limited to Federal, state and local requirements, pertaining to legal disposal of all construction and demolition waste materials.

1.4 RELATED REQUIREMENTS

A. Section 01 31 00 Project Management and Coordination: Additional requirements for project meetings, reports, submittal procedures, and project documentation.

B. Section 01 50 00 – Temporary Facilities and Controls: Additional requirements related to trash/waste collection and removal facilities and services.

C. Section 01 60 00 – Product Requirements: Waste prevention requirements related to delivery, storage, and handling.

D. Section 01 70 00 – Execution and Closeout Requirements: Trash/waste prevention procedures related to demolition, cutting and patching, installation, protection, and clearing.

E. Section 01 81 13.13 – Sustainable Design Requirements

1.5 DEFINITIONS

A. Clean: untreated and unpainted; not contaminated with oils, solvents, caulk, or the like.

B. Construction Demolition Waste: solid wastes typically including building materials, packaging, trash, debris, and rubble resulting from construction, remodeling, repair and demolition operations.

C. Disposal: removal of off-site demolition and construction waste and subsequent sale, recycling, reuse or deposit in landfill or incinerator acceptable to authorities having jurisdiction.

D. Hazardous: Exhibiting the characteristics of hazardous substances, i.e. ignitibility, corrosivity, toxicity or reactivity.

E. Nonhazardous: exhibiting none of the characteristics of hazardous substances, i.e. ignitibility, corrosivity, toxicity or reactivity.

F. Nontoxic: neither immediately poisonous to humans nor poisonous after a long period of exposure.

G. Recyclable: the ability of a product or materials to be recovered at the end of its life cycle and remanufactured into a new product for reuse by others.

H. Recycle: to remove a waste material from the project site to another site for remanufacture into a new product for reuse by others.

I. Recycling: the process of sorting, cleansing, treating and reconstituting solid waste and other discarded materials for the purpose of using the altered form. Recycling does not include burning, incinerating or thermally destroying waste.

J. Return: to give back reusable items or unused products to vendors for credit.

K. Reuse: to reuse a construction waste material in some manner on the project site.

L. Salvage: to remove a waste materials from the project site to another site for resale or reuse by others.

M. Sediment: Soil and other debris that has been eroded and transported by storm or well production run-off water.

N. Source Separation: the act of keeping different types of waste materials separate beginning from the first time they become waste.

O. Toxic: poisonous to humans either immediately or after a long period of exposure.

P. Trash: any product or material unable to be reused, returned, recycled, or salvaged.

Q. Waste: extra material or material that has reached the end of its useful life in it intended use. Waste includes salvageable, returnable, recyclable, and reusable material.

1.6 SUBMITTALS

A. See Section 01 33 00 – Submittal Procedures, for submittal procedures.

B. LEED Submittals: Submit Landfill Alternatives Proposal, Waste Management Plan, and Waste Disposal Reports in accordance with procedures specified in Section 01 33 00.

C. Submit Waste Management Plan within 30 days after receipt of Notice to Proceed, or prior to any trash or waste removal, whichever occurs sooner; submit projection of all trash and waste that will require disposal and alternatives to land filling.

D. Waste Management Plan: Include the following information:

1. General: Develop a waste management plan according to ASTM E 1609 and requirements of this Section. Plan shall consist of waste identification, waste reduction work plan, and cost/revenue analysis. Indicate quantities by weight or volume, but use same units of measure throughout waste management plan.
2. Waste identification: Indicate anticipated types and quantities of site-clearing and construction waste generated by the Work. Include estimated quantities and assumptions for estimates.
   a. See Section 01 74 19 CWF for Construction Waste Identification Form
3. Analysis of the trash and waste projected to be generated during this phase of the project construction cycle, including types and quantities.
4. Landfill Options: the name address and telephone number of the landfill(s) where trash/waste will be disposed of, the applicable landfill tipping fee(s), and the projected cost of disposing of all project trash/waste in the landfill(s).
5. Landfill Alternatives: List all waste materials that will be diverted from landfills by reuse, salvaged, or recycling.

   a. List each material proposed to be salvaged, reused, or recycled.
   b. List the local market for each material.
   c. State the estimated net cost, versus landfill disposal.

6. Meetings: Describe regular meetings to be held to address waste prevention, reduction, recycling, salvage, reuse, and disposal.
7. Materials Handling Procedures: Describe the means by which materials to be diverted from landfills will be protected from contamination and prepared for acceptance by designated facilities; include separation procedures for recyclables, storage, and packaging.
8. Transportation: Identify the destination and means of transportation of materials to be recycled; i.e. whether materials will be site-separated and self-hauled to designated centers, or whether mixed materials will be collected by a waste hauler.
9. Recycling Incentives: Describe procedures required to obtain credits, rebates, or similar incentives.

E. Waste Reduction Work Plan: List each type of waste and whether it will be salvaged, recycled, or disposed of in landfill or incinerator. Include points of waste generation, total quantity of each type of waste, quantity for each means of recovery, and handling and transportation procedures.

1. See Section 01 74 19 CWF for Construction Waste Reduction Work Plan Form.
2. See Section 01 74 19 CWF for Cost/Revenue Analysis of Construction Waste Reduction Work Plan Form.
3. Salvaged Materials for Reuse. For materials that will be salvaged and reused in this Project, describe methods for preparing salvaged materials before incorporation into the Work.
4. Salvaged Materials for Sale: For materials that will be sold to individuals and organizations, include list of their names, addresses, and telephone numbers.
5. Salvaged Materials for Donation: For materials that will be donated to individuals and organizations, include list of their names, addresses, and telephone numbers.
6. Recycled Materials: Include list of local receivers and processors and type of recycled materials each will accept. Include names, addresses, and telephone numbers.
7. Disposed Materials: Indicate how and where materials will be disposed of. Include name, address, and telephone number of each landfill and incinerator facility
8. Handling and Transportation Procedures: Include method that will be used for separating recyclable waste including sizes of containers, container labeling, and designated location on Project site where materials separation will be located.

F. Waste Disposal Reports: Submit at specified intervals, with details of quantities of trash and waste, means of disposal or reuse, and costs; show both totals to date and since last report.

1. Submit updated Report with each Application for Progress Payment; failure to submit Report will delay payment.

   a. LEED MR Credit 2 Template shall be updated, printed and attached to Application for Payment
   b. Update Materials Tracking Spreadsheet for materials that are included in Application for Payment and attach to Application for Payment

2. Submit Report on a form acceptable to Owner.
3. Landfill Disposal: Include the following information

   a. Identification of material
   b. Generation point of waste
   c. Amount, in tons or cubic yards, of trash/waste material from the project disposed of in landfills.
   d. Quantity of waste salvaged both estimated and actual in tons or cubic yards.
   e. Quantity of waste recycled both estimated and actual in tons or cubic yards.
   f. Total quantity of waste recovered (salvaged and recycled) in tons or cubic yards.
   g. Total quantity of waste recovered (salvaged and recycled) as a percentage of total waste.
   h. State the identity of landfills, total amount of tipping fees paid to landfill, and total disposal cost.
   i. Include manifests, weight tickets, receipts, and invoices as evidence of quantity and cost.

4. Recycled and Salvaged Materials: Include the following information for each:

   a. Identification of material, including those retrieved by installer or use on other projects.
   b. Amount, in tons or cubic yards, of trash/waste material from the project disposed of in landfills.
   c. Transportation cost, amount paid or received for the material, and the net total cost or savings of salvage or recycling each material
   d. Include manifests, weight tickets, receipts, and invoices as evidence of quantity and cost.
   e. Certification by receiving party that materials will not be disposed of in landfills or by incineration.

5. Materials Reused on Project: Include the following information for each:

   a. Identification of material and how it was used in the project
   b. Amount, in tons or cubic yards
   c. Include weight tickets as evidence of quantity.

6. Other Disposal Methods: Include information similar to that described above, as appropriate to disposal method.

G. Waste Reduction Calculations: Before request for Substantial Completion, submit calculated end-of-project rates for salvage, recycling, and disposal as a percentage of total waste generated by the work.

H. Records of Donations: Indicate receipt and acceptance of salvageable waste donated to individuals and organizations. Indicate whether organization is tax exempt.

I. Record of Sales: Indicate receipt and acceptance of salvageable waste sold to individuals and organizations. Indicate whether organization is tax exempt.

J. Recycling and Processing Facility Records: Indicate receipt and acceptance of recyclable waste by recycling and processing facilities licensed to accept them. Include manifests, weight tickets, receipts, and invoices.

K. Landfill Disposal Records: Indicate receipt and acceptance of waste by landfills licensed to accept them. Include manifests, weight tickets, receipts, and invoices.

PART 2 - PRODUCTS

2.1 PRODUCT SUBSTITUTIONS

A. See Section 01 60 00 – Product Requirements for substitution submission procedures.

B. For each proposed product substitution, submit the following information in addition to requirements specified in Section 01 60 00.

1. Relative amount of waste produced, compared to specific product.
2. Cost savings on waste disposal, compared to specified product, to be deducted from the contract sum
3. Proposed disposal method for waste product.
4. Markets for recycled waste production.

PART 3 - EXECUTION

3.1 WASTE MANAGEMENT PLAN IMPLEMENTATION

A. General: Implement approved waste management plan. Provide handling, containers, storage, signage, transportation, and other items as required to implement waste management plan during the entire duration of the Contract.

B. Manager: Designate an on-site person or persons responsible for instructing workers and overseeing and documenting results of the Waste Management Plan.

C. Communication

1. Distribute copies of the Waste Management Plan to job site foreman, each subcontractor, Owner, Construction Manager and Architect.
2. Distribute waste management plan to entities when they first begin work on site. Review plan procedures and locations established for salvage, recycling, and disposal.

D. Instruction: Provide on-site instruction of appropriate separation, handling, and recycling, salvage, reuse, and return methods to be used by all parties at the appropriate stages of the project.

E. Meetings: Discuss trash / waste management goals and issues at project meetings.

1. Pre-construction meeting
2. Regular job-site meetings

F. Facilities: Provide specific facilities for separation and storage of materials for recycling, salvage, reuse, return, and trash disposal, for use by all contractors and installers.

1. At a minimum, provide:

   a. Separate area for storage of materials to be reused on-site, such as wood cut-offs for blocking.
   b. Separate dumpsters for each category of recyclable.
   c. Recycling bins at worker lunch area.

2. Provide containers as required
3. Provide temporary enclosures around piles of separated materials to be recycled or salvaged
4. Provide materials for barriers and enclosures that are nonhazardous, recyclable, or reusable to the maximum extent possible; reuse project construction waste materials if possible.
5. Locate enclosures out of the way of construction traffic.
6. Conduct waste management operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.
7. Provide adequate space for pick-up and delivery and convenience to subcontractors.
8. If an enclosed area is not provided, clearly lay out and label a specific area on-site.
9. Keep recycling and trash / waste bin areas neat and clean and clearly marked in order to avoid contamination of materials.

G. Hazardous Wastes: Separate, store, and dispose of hazardous wastes according to applicable regulations.

H. Recycling: Separate, store, protect, and handle at the site identified recyclable waste products in order to prevent contamination of material and to maximize recyclability of identified materials. Arrange for timely pickups from the site or deliveries to recycling facility in order to prevent contamination of recyclable materials.

I. Reuse of Materials On-Site: Set aside, sort and protect separated products in preparation for reuse.

1. Contractor for this contract is encouraged to present creative ways to reuse resources in the project

J. Salvage: Set aside, sort, and protect products to be salvaged for reuse off-site.

3.2 RECYCLING CONSTRUCTION WASTE, GENERAL

A. General: Recycle paper and beverage containers used by on-site workers.

B. Recycling Incentives: Revenues, savings, rebates, tax credits, and other incentives received for recycling waste materials shall accrue to Contractor.

C. Procedures: Separate recyclable waste from other waste materials, trash, and debris. Separate recyclable waste by type at project site to the maximum extent practical according to approved construction waste management plan.

1. Provide appropriately marked containers or bins for controlling recyclable waste until they are removed from Project site. Include list of acceptable and unacceptable materials at each contain and bin.

    a. Inspect containers and bins for contamination and remove contaminated materials if found.
2. Stockpile processed materials on-site without intermixing with other materials. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.
3. Stockpile Materials away from construction area. Do not store within drip line of remaining trees.
4. Store components off the ground and protect from the weather.
5. Remove recyclable waste off Owner's property and transport to recycling receiver or processor.

3.3 RECYCLING CONSTRUCTION WASTE

A. Packaging:

1. Cardboard and Boxes: Break down packaging into flat sheets. Bundle and store in a dry location.
2. Pallets: as much as possible, require deliveries using pallets to remove pallets from Project site. For pallets that remain on-site, break down pallets into component wood pieces and comply with requirements for recycling wood.
3. Crates: Break down crate into component wood pieces and comply with requirements for recycling wood.

B. Site-Clearing Wastes: Chip brush, branches, and trees.

C. Wood Materials:

1. Clean Cut-Offs of Lumber: Grind or chip into small pieces.
2. Clean Sawdust: Bag sawdust that does not contain painted or treated wood.

3.4 DISPOSAL OF WASTE

A. General: Except for items or materials to be salvaged, recycled, or otherwise reused, remove waste materials from Project site and legally dispose of them in a landfill or incinerator acceptable to authorities having jurisdiction.

1. Except as otherwise specified, do not allow waste materials that are to be disposed of accumulate on-site.
2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.

B. Burning: Do not burn waste materials.

C. Disposal: Transportation of waste materials off Owner's property and legally dispose of them, except for items agreed upon by the Owner to be disposed of on site.

3.5 ATTACHMENTS

A. Section 01 74 19 CWF – Form CWM-1 For Construction Waste Identification

B. Section 01 74 19 CWF – Form CWM-2 for Construction Waste Reduction Work Plan.

C. Section 01 74 19 CWF – Form CWM-3 for Cost/Revenue Analysis of Construction Waste Reduction Work Plan.

END OF SECTION 01 74 19

FORM CWM-1: CONSTRUCTION WASTE IDENTIFICATION							
MATERIAL CATEGORY	GENERATION POINT	EST. QUANTITY OF MATERIALS RECEIVED* (A)	EST. WASTE % (B)	TOTAL EST. QUANTITY OF WASTE* (C=AxB)	EST. VOLUME CUBIC YARDS	EST. WEIGHT TONS	REMARKS AND ASSUMPTIONS
Packaging: Cardboard							
Packaging: Boxes							
Packaging: Plastic Sheet or Film							
Packaging: Plystyrene							
Packaging: Pallets or Skids							
Packaging: Crates							
Packaging: Plastic Pails							
Site-Clearing Waste							
Masonry or CMU							
Lumber: Cut-Offs							
Lumber: Warped Pieces							
Plywood or OSB							
Wood Forms							
Wood Waste Chutes							
Wood Trim (cut-offs)							
Metals							
Joint Sealant Tubes							
Piping							
Electrical Conduit							
Other:							
*Insert unit of measure							

FORM CWM-2: CONTRUCTION WASTE REDUCTION WORK PLAN						
MATERIAL CATEGORY	GENERATION POINT	TOTAL EST. QUANTITY OF WASTE TONS	DISPOSAL METHOD AND QUANTITY			HANDLING AND TRANSPORTATION PROCEDURES
			EST. AMOUNT SALVAGED TONS	EST. AMOUNT RECYCLED TONS	EST. AMOUNT DISPOSED TO LANDFILL TONS	
Packaging: Cardboard						
Packaging: Boxes						
Packaging: Plastic Sheet or Film						
Packaging: Plystyrene						
Packaging: Pallets or Skids						
Packaging: Crates						
Packaging: Plastic Pails						
Site-Clearing Waste						
Masonry or CMU						
Lumber: Cut-Offs						
Lumber: Warped Pieces						
Plywood or OSB						
Wood Forms						
Wood Waste Chutes						
Wood Trim (cut-offs)						
Metals						
Joint Sealant Tubes						
Piping						
Electrical Conduit						
Other:						

FORM CWM-3: COST/REVENUE ANALYSIS OF CONSTRUCTION WASTE REDUCTION WORK PLAN								
MATERIAL CATEGORY	TOTAL QUANTITY OF MATERIALS (VOL. OR WEIGHT) (A)	EST. COST OF DISPOSAL (B)	TOTAL EST. COST OF DISPOSAL (C=AxB)	REVENUE FROM SALVAGED MATERIALS (D)	REVENUE FROM RECYCLED MATERIALS (E)	LANDFILL TIPPING FEES AVOIDED (F)	HANDLING AND TRANSPORTA-TION COSTS AVOIDED (G)	NET COST SAVINGS OF WORK PLAN (H=D+E+F+G)
Packaging: Cardboard								
Packaging: Boxes								
Packaging: Plastic Sheet or Film								
Packaging: Plystyrene								
Packaging: Pallets or Skids								
Packaging: Crates								
Packaging: Plastic Pails								
Site-Clearing Waste								
Masonry or CMU								
Lumber: Cut-Offs								
Lumber: Warped Pieces								
Plywood or OSB								
Wood Forms								
Wood Waste Chutes								
Wood Trim (cut-offs)								
Metals								
Joint Sealant Tubes								
Piping								
Electrical Conduit								
Other:								

SECTION 01 77 00 – CLOSEOUT PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes administrative and procedural requirements for Contract closeout, including, but not limited to, the following:

1. Review procedures.
2. Project Record Documents.
3. Operation and maintenance manuals.
4. Warranties.
5. Instruction of Owner's personnel.
6. Final cleaning.

1.3 SUBSTANTIAL COMPLETION

A. Preliminary Procedures: Before requesting site visit review for determining date of Substantial Completion, complete the following. List items below that are incomplete in request.

1. Prepare a list of items to be completed and corrected (punch list), the value of items on the list, and reasons why the Work is not complete.
2. Advise Owner of pending insurance changeover requirements.
3. Obtain and submit releases permitting Owner unrestricted use of the Work and access to services and utilities. Include occupancy permits, operating certificates, and similar releases.
4. Prepare and submit Project Record Documents, operation and maintenance manuals, property surveys, and similar final record information.
5. Deliver tools, spare parts, extra materials, and similar items to location designated by Owner. Label with manufacturer's name and model number where applicable.
6. Make final changeover of permanent locks and deliver keys to Owner. Advise Owner's personnel of changeover in security provisions.
7. Terminate and remove temporary facilities from Project site, along with mockups, construction tools, and similar elements.
8. Complete final cleaning requirements.
9. Touch up and otherwise repair and restore marred exposed finishes to eliminate visual defects.

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

1. Results of completed review will form the basis of requirements for Final Completion.

1.4 FINAL COMPLETION

A. Preliminary Procedures: Before requesting final site visit review for determining date of Final Completion, complete the following:

1. Submit certified copy of Architect's Substantial Completion review list of items to be completed or corrected (punch list). The certified copy of the list shall state that each item has been completed or otherwise resolved for acceptance.
2. Submit evidence of final, continuing insurance coverage complying with insurance requirements.
3. Submit specific warranties and workmanship bonds.

B. Review: Submit a written request for final review for acceptance. On receipt of request, Architect will either proceed with review or notify Contractor of unfulfilled requirements.

1.5 LIST OF INCOMPLETE ITEMS (PUNCH LIST)

A. Preparation: Submit three copies of list. Include name and identification of each space and area affected by construction operations for incomplete items and items needing correction including, if necessary, areas disturbed by Contractor that are outside the limits of construction.

1. Include the following information at the top of each page:

a. Project name.
b. Date.
c. Name of Architect.
d. Name of Contractor.
e. Page number.

1.6 PROJECT RECORD DOCUMENTS

A. General: Do not use Project Record Documents for construction purposes. Protect Project Record Documents from deterioration and loss. Provide access to Project Record Documents for Architect's reference during normal working hours.

B. Record Drawings: Maintain and submit one set of black-line white prints of Contract Drawings and Shop Drawings.

1. Mark Record Prints to show the actual installation where installation varies from that shown originally. Require individual or entity that obtained record data, whether individual or entity is Installer, subcontractor, or similar entity, to prepare the marked-up Record Prints.

a. Give particular attention to information on concealed elements that cannot be readily identified and recorded later.
b. Accurately record information in an understandable drawing technique.
c. Record data as soon as possible after obtaining it. Record and check the markup before enclosing concealed installations.
d. Mark Contract Drawings or Shop Drawings, whichever is most capable of showing actual physical conditions, completely and accurately. Where Shop Drawings are marked, show cross-reference on Contract Drawings.

2. Mark record sets with indelible red pen. Use other colors to distinguish between changes for different categories of the Work at the same location.
3. Mark important additional information that was either shown schematically or omitted from original Drawings.
4. Note Construction Change Directive numbers, Change Order numbers, alternate numbers, and similar identification where applicable.
5. Identify and date each Record Drawing; include the designation "PROJECT RECORD DRAWING" in a prominent location. Organize into manageable sets; bind each set with durable paper cover sheets. Include identification on cover sheets.

C. Record Specifications: Submit one copy of Project's Specifications, including addenda and contract modifications. Mark copy to indicate the actual product installation where installation varies from that indicated in Specifications, addenda, and Contract modifications.

1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
2. Mark copy with the proprietary name and model number of products, materials, and equipment furnished, including substitutions and product options selected.
3. Note related Change Orders, Record Drawings, and Product Data, where applicable.

D. Record Product Data: Submit one copy of each Product Data submittal. Mark one set to indicate the actual product installation where installation varies substantially from that indicated in Product Data.

1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
2. Include significant changes in the product delivered to Project site and changes in manufacturer's written instructions for installation.
3. Note related Change Orders, Record Drawings, and Record Specifications, where applicable.

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

1.7 OPERATION AND MAINTENANCE MANUALS

A. Assemble a complete set of operation and maintenance data indicating the operation and maintenance of each system, subsystem, and piece of equipment not part of a system. Include operation and maintenance data required in individual Specification Sections and as follows:

1. Operation Data:

   a. Emergency instructions and procedures.
   b. System, subsystem, and equipment descriptions, including operating standards.
   c. Piping diagrams.

2. Maintenance Data:

   a. Manufacturer's information, including list of spare parts.
   b. Name, address, and telephone number of Installer or supplier.
   c. Maintenance procedures.
   d. Maintenance and service schedules for preventive and routine maintenance.

e. Maintenance record forms.
f. Sources of spare parts and maintenance materials.
g. Copies of maintenance service agreements.
h. Copies of warranties and bonds.

B. Organize operation and maintenance manuals into suitable sets of manageable size. Bind and index data in heavy-duty, 3-ring, vinyl-covered, loose-leaf binders, in thickness necessary to accommodate contents, with pocket inside the covers to receive folded oversized sheets. Identify each binder on front and spine with the printed title "OPERATION AND MAINTENANCE MANUAL," Project name, and subject matter of contents. Submit to Architect for review.

C. After review and comments by Architect, submit three complete sets (3 hard copies and 3 electronic copies on CD-Rom) of O&M manual to Owner at Substantial Completion.

1.8 WARRANTIES

A. Submittal Time: Submit three written warranties on request of Architect for designated portions of the Work where commencement of warranties other than date of Final Completion is indicated.

B. Organize warranty documents into an orderly sequence based on the table of contents of the Project Manual.

1. Bind warranties and bonds in heavy-duty, 3-ring, vinyl-covered, loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8-1/2-by-11-inch (115-by-280-mm) paper.
2. Provide heavy paper dividers with plastic-covered tabs for each separate warranty. Mark tab to identify the product or installation. Provide a typed description of the product or installation, including the name of the product and the name, address, and telephone number of Installer.
3. Identify each binder on the front and spine with the typed or printed title "WARRANTIES," Project name, and name of Contractor.

C. Provide additional copies of each warranty to include in operation and maintenance manuals.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Cleaning Agents: Use cleaning materials and agents recommended by manufacturer or fabricator of the surface to be cleaned. Do not use cleaning agents that are potentially hazardous to health or property or that might damage finished surfaces.

PART 3 - EXECUTION

3.1 DEMONSTRATION AND TRAINING

A. Instruction: Instruct Owner's personnel to adjust, operate, and maintain systems, subsystems, and equipment not part of a system.

1. Provide instructors experienced in operation and maintenance procedures.

2. Provide instruction at mutually agreed-on times. For equipment that requires seasonal operation, provide similar instruction at the start of each season.
3. Schedule training with Owner with at least seven days' advance notice to Owner and Architect.
4. Coordinate instructors, including providing notification of dates, times, length of instruction, and course content.

3.2 FINAL CLEANING

A. General: Provide final cleaning. Conduct cleaning and waste-removal operations to comply with local laws and ordinances and Federal and local environmental and antipollution regulations.

B. Cleaning: Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to condition expected in an average commercial building cleaning and maintenance program. Comply with manufacturer's written instructions.

1. Complete the following cleaning operations before requesting inspection for certification of Substantial Completion for entire Project or for a portion of Project:

   a. Clean Project site, yard, and grounds, in areas disturbed by construction activities, including landscape development areas, of rubbish, waste material, litter, and other foreign substances.
   b. Sweep paved areas broom clean. Remove petrochemical spills, stains, and other foreign deposits.
   c. Rake grounds that are neither planted nor paved to a smooth, even-textured surface.
   d. Remove tools, construction equipment, machinery, and surplus material from Project site.
   e. Remove snow and ice to provide safe access to building.
   f. Clean exposed exterior and interior hard-surfaced finishes to a dirt-free condition, free of stains, films, and similar foreign substances. Avoid disturbing natural weathering of exterior surfaces. Restore reflective surfaces to their original condition.
   g. Remove debris and surface dust from limited access spaces, including roofs, plenums, shafts, trenches, equipment vaults, manholes, attics, and similar spaces.
   h. Remove labels that are not permanent.
   i. Touch up and otherwise repair and restore marred, exposed finishes and surfaces. Replace finishes and surfaces that cannot be satisfactorily repaired or restored or that already show evidence of repair or restoration.
      1) Do not paint over "UL" and similar labels, including mechanical and electrical nameplates.
   j. Replace parts subject to unusual operating conditions.
   k. Leave Project clean and ready for occupancy.

C. Comply with safety standards for cleaning. Do not burn waste materials. Do not bury debris or excess materials on Owner's property. Do not discharge volatile, harmful, or dangerous materials into drainage systems. Remove waste materials from Project site and dispose of lawfully.

END OF SECTION 01 77 00

SECTION 01 81 13 - SUSTAINABLE DESIGN REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes general requirements and procedures for compliance with certain USGBC LEED prerequisites and credits needed for Project to obtain LEED Platinum certification based on USGBC's "LEED 2009 for New Construction & Major Renovations."

1. Other LEED prerequisites and credits needed to obtain LEED certification depend on product selections and may not be specifically identified as LEED requirements. Compliance with requirements needed to obtain LEED prerequisites and credits may be used as one criterion to evaluate substitution requests and comparable product requests.
2. Additional LEED prerequisites and credits needed to obtain the indicated LEED certification depend on Architect's design and other aspects of Project that are not part of the Work of the Contract.
3. Some LEED prerequisites and credits needed to obtain the indicated LEED certification depend on the Contractor's procedures and records. Compliance with these requirements is a part of this contract and are the Contractor's responsibility. Proper compliance throughout progress of the work is require to the satisfaction of the Architect and LEED Consultant as a prerequisite to recommending payment to the Owner of the Application for Payment.

B. Related Requirements:

1. Divisions 01 through 33 Sections for LEED requirements specific to the work of each of these Sections. Requirements may or may not include reference to LEED.

1.3 REFERENCES

A. The publications listed below form a part of this Specification to the extent referenced. The publications are referred to in the text by the basic designation only.

B. The edition/revision of the referenced publications shall be the latest date as of the date of the Contract Documents, unless otherwise specified.

C. Forest Stewardship Council (FSC):

1. FSC STD-01-001, "FSC Principles and Criteria for Forest Stewardship."

1.4 DEFINITIONS

A. Definitions: The following list of definitions is for reference and is not intended to be comprehensive. Refer to LEED Reference Guide for definition of terms used in reference to the LEED certification process throughout the project manual.

B. Chain-of-Custody Certificates: Certificates signed by manufacturers certifying that wood used to make products was obtained from forests certified by an FSC-accredited certification body to

comply with FSC STD-01-001, "FSC Principles and Criteria for Forest Stewardship." Certificates shall include evidence that manufacturer is certified for chain of custody by an FSC-accredited certification body.

C. Commissioning: From the LEED Reference Guide, "Commissioning is the process of verifying and documenting that a building and all of its systems and assemblies are planned, designed, installed, tested, operated, and maintained to meet the owner's project requirements."

D. Commissioning Plan: From the LEED Reference Guide, "Commissioning Plan is a document that outlines the organization, schedule, allocation of resources, and documentation requirements of the commissioning process."

E. Construction IAG Management Plan: From the LEED Reference Guide, "Construction IAG Management Plan outlines measures to minimize contamination in a specific project building during construction and describes procedures to flush the building of contaminants prior to occupancy."

F. LEED: Leadership in Energy and Environmental Design. The LEED Green Building Rating System, or LEED, is a voluntary, consensus-based, market-driven building system based on proven technology. It evaluates environmental performance from a whole building perspective over a building's life-cycle, providing a definitive standard of what constitutes a green building. The LEED system is administered by the U.S. Green Building Council (USGBC).

G. Manufacturing: Refers to the final assembly of components into the building product.

H. Ozone Depleting Substances: Materials and chemical compounds that are destructive to the ozone layer. CFCs and HCFCs, aerosol sprays, and other similar substances are considered "ozone depleting."

I. Rapidly Renewable Materials: Agricultural products, both fiber and animal, that take 10 years or less to grow or raised and can be harvested in a sustainable fashion.

J. Recycled Content: The recycled content value of a material assembly shall be determined by weight. The recycled fraction of the assembly is then multiplied by the cost of assembly to determine the recycled content value.

1. "Post-consumer" material is defined as waste material generated by households or by commercial, industrial, and institutional facilities in their role as end users of the product, which can no longer be used for its intended purpose.
2. "Pre-consumer" material is defined as material diverted from the waste stream during the manufacturing process. Excluded is reutilization of materials such as rework, regrind, or scrap generated in a process and capable of being reclaimed within the same process that generated it.

K. Regional Materials: Materials that have been extracted, harvested, or recovered, as well as manufactured, within 500 miles of Project site. If only a fraction of a product or material is extracted/harvested/recovered and manufactured locally, then only that percentage (by weight) shall contribute to the regional value.

L. Salvaged Materials or Reused Materials: Construction materials recovered from existing buildings or construction sites and reused.

M. USGBC: U.S. Green Building Council, a not for profit coalition of leading and visionary organizations from all segments of the building industry that have joined forces to integrate, lead,

and educate the building industry's efforts to develop and market products and services that are more environmentally and economically viable.

N. Volatile Organic Compounds (VOC's): Chemical compounds common in and emitted by many building products over time through outgassing, including, but not limited to, the following:

1. Solvents in paints and other coatings.
2. Wood preservatives, strippers, and household cleaners.
3. Adhesives in particleboard, fiberboard, and some plywoods.
4. Foam insulation.

A. Waste Management Plan: A Project-related plan for the collection, transportation, and disposal of the waste generated at the construction site. The purpose of the plan is to ultimately reduce the amount of material being land filled.

1.5 LEED SUBMITTALS

A. General: Submit additional LEED submittals required by other Specification Sections.

1. LEED submittals are in addition to other submittals. If submitted item is identical to that submitted to comply with other requirements, submit duplicate copies as a separate submittal to verify compliance with indicated LEED requirements.

B. LEED Action Plans: Provide preliminary submittals within 30 days of date established for commencement of the work indicating how the following requirements will be met.

1. Credit MR 2: Waste management plan complying with Division 01 Section – 01 74 19 Construction Waste Management and Disposal.
2. Credit MR 3: List of proposed salvaged and refurbished materials. Identify each material that will be salvaged or refurbished, including, but not limited to, its source, cost, and replacement cost if the item was to be purchased new.
3. Credit MR 4: List of proposed materials with recycled content. Indicate cost, post-consumer recycled content, and pre-consumer recycled content for each product having recycled content.
4. Credit MR 5: List of proposed regional materials. Identify each regional material, including its source, cost, and the fraction by weight that is considered regional.

C. LEED Progress Reports: Concurrent with each Application for Payment, submit reports comparing actual construction and purchasing activities with LEED action plans for the following:

1. Credit MR 2: Waste reduction progress reports complying with Division 01 Section – 01 74 19 Construction Waste Management and Disposal
2. Credit MR 3: Salvaged and refurbished materials.
3. Credit MR 4: Recycled content.
4. Credit MR 5: Regional materials.
5. Credit MR 7: Certified wood products.

D. LEED Documentation Submittals:

1. Credit MR 2: Comply with Division 01 Section 01 74 19 "Construction Waste Management and Disposal."
2. Credit MR 3: Receipts for salvaged and refurbished materials used for Project, indicating sources and costs for salvaged and refurbished materials.

3. Credit MR 4: Product data and certification letter indicating percentages by weight of post-consumer and pre-consumer recycled content for products having recycled content. Include statement indicating cost for each product having recycled content.
4. Credit MR 5: Product data for regional materials indicating location and distance from Project of material manufacturer and point of extraction, harvest, or recovery for each raw material. Include statement indicating cost for each regional material and the fraction by weight that is considered regional.
5. Credit MR 7: Product data and chain-of-custody certificates for products containing certified wood. Include statement indicating cost for each certified wood product.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For LEED coordinator.

1.7 QUALITY ASSURANCE

A. LEED Coordinator: Engage an experienced LEED Accredited Professional to coordinate LEED requirements. LEED coordinator may also serve as waste management coordinator.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

A. Provide products and procedures necessary to obtain LEED credits required in this Section. Although other Sections may specify some requirements that contribute to LEED credits, the Contractor shall determine additional materials and procedures necessary to obtain LEED credits indicated.

2.2 RECYCLED CONTENT OF MATERIALS

A. Credit MR 4.1: Building materials shall have recycled content such that post-consumer recycled content plus one-half of pre-consumer recycled content for Project constitutes a minimum of 10 percent of cost of materials used for Project.

1. Cost of post-consumer recycled content plus one-half of pre-consumer recycled content of an item shall be determined by dividing weight of post-consumer recycled content plus one-half of pre-consumer recycled content in the item by total weight of the item and multiplying by cost of the item.

PART 3 - EXECUTION

3.1 CONSTRUCTION WASTE MANAGEMENT

A. Credit MR 2: Comply with Division 01 - CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL.

END OF SECTION 01 81 13

DIVISION 1 – SPECIAL REQUIREMENTS

INSERT A

REPORT OF
GEOTECHNICAL EXPLORATION

DARLA MOORE SCHOOL OF BUSINESS
COLUMBIA, SOUTH CAROLINA
S&ME PROJECT NO. 1611-10-426rev1

Prepared For:

University of South Carolina
Campus Planning & Construction
743 Greene Street
Columbia, South Carolina 29208

Prepared By:

S&ME, Inc.
134 Suber Road
Columbia, South Carolina 29210

October 17, 2011

S&ME

October 17, 2011

University of South Carolina
Campus Planning and Construction
743 Greene Street
Columbia, South Carolina 29208

Attention: Ms. Lekita Hargrave

Reference: **Report of Geotechnical Exploration**
Darla Moore School of Business
Columbia, South Carolina
S&ME Project No. 1611-10-426rev1

Dear Ms. Hargrave:

As requested, S&ME, Inc. has conducted a geotechnical exploration at the above referenced site. The exploration was conducted in general accordance with S&ME Proposal No. 1611-7714-10 dated September 7, 2010, and Change of Scope letter dated April 12, 2011. The purpose of this exploration was to characterize the general subsurface conditions of the site, and evaluate these conditions relative to the proposed construction. This report includes our understanding of the proposed construction, field test and laboratory data, and recommendations regarding site preparation, fill placement, seismic design parameters, and foundation types and design values. This revision to the report incorporates several changes made to the design of the structure as well as addendums provided by S&ME to the design team after submission of our initial report.

S&ME appreciates this opportunity to work with USC as your geotechnical engineering consultant on this project. If you have any questions or need any further information in regard to this geotechnical report, or if we can be of additional service to you, please do not hesitate to contact us.

Sincerely,
S&ME,

SOUTH CAROLINA PROFESSIONAL ENGINEER
10/17/11
No. 26993
MATTHEW C. GLUNT

Matthew Glunt, P.E.
Geotechnical Engineer
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jlessley@smeinc.com

SOUTH CAROLINA
S&ME, INC.
No. C00473
CERTIFICATE OF AUTHORITY

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APPENDIX B

Exploration Procedures
Soil Test Boring Logs

APPENDIX C

Laboratory Procedures
Laboratory Test Results

EXECUTIVE SUMMARY

The information provided in this executive summary is intended to be a brief overview of project information and recommendations from the geotechnical report. Information in the executive summary should not be used without first reading the geotechnical report and the recommendations described therein.

Shallow foundations appear suitable for support of the proposed structure and may consist of spread footings supporting isolated columns, mat footings for supporting large area loads, combined footings for supporting loads from several columns, or strip footings for supporting walls.

Our foundation support recommendations given in this report will remain valid only if all excavated footings are examined by an S&ME representative prior to concreting to ensure that bearing soils are similar to what was encountered in our borings and that unsuitable soils have been removed from the footing subgrades.

A net bearing pressure of 5,000 psf or less is recommended for core footings. A net bearing pressure of 5,000 psf or less is recommended for column footings that bear at or below an elevation of +230 ft. A net bearing pressure of 3,000 psf or less is recommended for Level 1 footings that are not adjacent to basement walls. A net bearing pressure of 3,000 psf or less is recommended for footings adjacent to core and basement walls, if the bearing elevation is approximately +234 ft. A net bearing pressure of 5,000 psf or less is recommended if the footings are extended to bear at or below an elevation of +230 ft. Recommended allowable bearing pressures may be increased by 1/3 for transient conditions, such as wind or seismic loads.

As much as 10 feet of fill was required to grade the western portion of this site during previous development. The deepest area lies just north of the stairway leading down to Park Street, adjacent to the Coliseum structure. We expect that up to 25 feet of existing fill lies directly behind the Coliseum basement wall and in utility line cuts. At our boring locations, the data suggest these soils to be very stiff in consistency and that they were likely placed with engineering control and sufficient compactive effort. However, the suitability of existing fill soils for support of new foundations will need to be closely evaluated during construction.

Based on boring data from this site, shear wave velocity measurements conducted by S&ME at nearby sites, and our knowledge of the general geologic profile of this area, Site Class C, as defined by IBC 2009, represents conditions at the site.

Ground water was encountered at elevations ranging from about +222 ft. to +205 ft. at the time of drilling. The ground water elevation did not change significantly during continued monitoring of two piezometers installed on site. We expect that ground water will be encountered during basement excavation perched near the terrace sand/kaolin clay

interface. Given the downslope position of the site, inflow may be significant through gravel to cobble-sized rock seams encountered at this depth, especially if these lenses are recharged somewhere up the hill. If encountered during excavation, perched water can likely be controlled by ditching or placement of sumps and pumping. Perimeter wall drains and a permanent underslab drainage system, as described in Section 6.7, should be installed behind walls and below the basement floor slabs.

The clayey sands and sandy clays in cut areas of the site appear suitable for re-use as structural fill. Sandy clays encountered in the river terrace stratum and some of the more cohesive clayey sands will be difficult to work with if allowed to become wet and will likely require moisture conditioning procedures during placement.

1. INTRODUCTION

The purpose of the geotechnical exploration was to identify the general subsurface stratification underlying the site and assess the physical properties of the soils in terms of their potential utility for foundation support, their relative suitability for use as structural fill, and their lateral earth pressures. Our objectives may be summarized as follows:

- Provide a geotechnical profile and interpretation of conditions within the site.
- Provide recommendations for preparation or improvement of the bearing soils to support proposed foundations, grade slabs, and retaining walls
- Assess in general terms the characteristics of the site in terms of earthquake hazards, including estimating the Site Class of this location as described in IBC Section 1613.
- Provide recommendations for design and construction of foundations.
- Provide recommendations for design and construction of grade slabs.
- Provide recommendations for design and construction of retaining walls.

2. PROJECT INFORMATION

Project information was summarized in a letter provided to Andrea Lamberti of Rafael Vinoly Architects (RVA) by Michelle Motchos of Stevens and Wilkinson (S&W), the project structural engineer, dated August 3, 2010. The project is a new academic building on the University of South Carolina campus located within the half block outlined by Assembly Street, Greene Street, Park Street and the Carolina Coliseum. This area is currently an asphalt surfaced parking lot with some landscaped areas.

Additional information regarding structural elements of the design were provided to S&ME by S&W in telephone and e-mail correspondence between March and June 2011. Current programming is for a 4-story building with partial basements in the eastern and western portions of the structure and sunken auditorium and lecture hall spaces in the central portion. Typical bay spans will be 21-ft by 21-ft on center for Level 1 and above. The sunken auditorium and lecture hall will involve larger spans, in particular the north-south auditorium span which is in excess of 140 feet. An open-air courtyard will be constructed atop Level 1 in the central portion of the structure, covering a large portion of the sunken space. A large portion of the structural load will be transferred to four concrete core shafts placed in the interior of the structure. The cores will extend to the basement level (Level 0), span one bay spacing of 21-ft. by 21-ft., and include elevator shafts sunken below the basement floor level.

The following summarizes our knowledge of the estimated structural loads and planned bearing elevations for the project:

- Typical core load of 4,300 kips (3,100k dead load + 1,200k live load), with the core shell comprising 70% of the dead load.
- Loads for the auditorium/lecture hall varying from about 435 kips to 875 kips (dead + live).

- Loads for other Level 1 footings varying from about 80 kips to 795 kips (dead + live).
- Approx footing bearing elevations: core footings = +224 ft., other Level 0 footings = +228 ft., auditorium/lecture hall footings = +228 ft., Level 1 footings adjacent to basement walls = +234 ft., other Level 1 footings = +248 ft.

The projected footprint is approximately 356 ft by 258 ft. The structure will lie adjacent to the Coliseum. Dimensioned building lines depicted on the rough layout provided to us show the building to be set back approximately 27 feet from the setback line along the Assembly Street sidewalk, approximately 74 feet from the centerline of Park Street, and about 49 feet from the centerline of Greene Street.

New pavements on the project are to include drop-off points near the Greene Street (North) entrance and near the Park Street loading dock. A drawing labeled *Level 2 Site Plan* (No. A0303) was provided by S&W on March 11, 2011. Based on this plan, it appears the drop-off points will be constructed near the existing grades with cuts or fills on the order of two feet or less likely required.

3. 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."* In exploring the site, we generally followed these standards and the approach described in our Proposal No. 1611-7714-10 dated September 7, 2010, and Change of Scope letter dated April 12, 2011. Right-of-entry to perform borings and other fieldwork on the property was conveyed with acceptance of our proposal.

3.1 Site Reconnaissance

Prior to performing our exploration for this site, we reviewed available field and laboratory data from nearby explorations for pertinent information including:

- USC undisclosed development within the block bounded by Greene, Park, Lincoln, and Blossom Streets (S&ME Project No. 1611-07-164, May 2007).

- USC Phase I Research Campus (Biomed) located one block north of this project, bounded by Park, Greene, Lincoln and College Streets (S&ME Project No. 1611-05-376, December 2005).

- USC Honors Dormitories located southeast of the site near the corner of Main and Blossom Streets (S&ME Project No. 1611-06-340, October 2006).

- USC Norman J. Arnold School of Public Health located northeast of the site and bounded by Assembly, College, Park and Pendleton Streets (S&ME Project No. 1611-01-276, October 2001).

- Chilled Water Plant located near the corner of Park and Devine Streets. This exploration was performed by MACTEC in March 2005. Results were provided to S&ME during performance of a previous nearby exploration.

The locations of these projects are shown on the attached site vicinity map (Figure 1) in Appendix A.

S&ME laid out boring locations on site in accessible locations within and near the planned structure footprint by measuring distances from existing site features. Sampling point locations were marked in the field with small colored flags or marking paint with the boring numbers indicated. Sampling point locations indicated on the attached "Boring Location Plan" must be considered as approximate. The elevations shown on our boring logs and subsurface profiles were interpolated from the topographic plan provided to S&ME and should also be considered as approximate.

3.2 Field Testing Procedures

Soil test borings were initially performed at the site between November 9th and November 12, 2010, using a truck-mounted drill rig. The borings were advanced using 2-1/4-inch inside diameter hollow-stem augers to refusal of the drilling equipment. Auger refusal occurred at depths ranging from 73.0 ft. to 123.0 ft. below the ground surface. Standard Penetration Testing (SPT) and split-spoon sampling in general accordance with ASTM D-1586 was performed at 2.5-foot intervals for the upper 10 feet of the borings and at maximum 5-foot intervals thereafter using a safety hammer. SPT "N" values were recorded for each sample taken. Representative samples of the soils obtained by the split-spoon sampler were collected and placed in suitably identified, sealed glass jars and transported to our laboratory. A summary of our exploration procedures is included in Appendix B.

On May 18 through May 25, 2011, we mobilized a drilling rig to the site and obtained nine relatively undisturbed soil samples at selected depths using pitcher and piston-type samplers. The samples were collected at four locations near the footprints of the planned structural cores, as shown on Figure 2. The samples were then delivered to labs in our Charlotte, NC, and Knoxville, TN, offices where they were logged, extruded and prepared for testing. Two of the samples contained too much gravel and/or saturated sand to extrude an acceptable sample for testing and were discarded. One-dimensional consolidation tests were performed on the seven remaining undisturbed samples of river terrace sediments and underlying Cretaceous-age materials.

Ground water measurements in the test borings were taken shortly after drilling was completed. Piezometers were installed in the boreholes of B-7 and B-10 to allow further monitoring of ground water levels. Because they were conducted in a heavily trafficked area, the remainder of the borings were backfilled with auger cuttings after the ground water measurements were completed.

3.3 Laboratory Testing

Recovered disturbed samples and field logs were transported to our laboratory. Soils were subsequently classified by the geotechnical engineer in general accordance with the visual-manual method described in ASTM D 2488, "*Standard Practice for Description and Identification of Soils (Visual-Manual Method)*", and assigned for laboratory testing as deemed necessary. Laboratory testing was conducted on representative soil samples to confirm field identification of the soils and establish engineering characteristics for design. Laboratory testing included the following:

- Seven (7) percent fines (wash 200 sieve) analyses (ASTM D1140).
- One (1) grain-size analysis (ASTM D422).
- Twelve (12) natural moisture content tests (ASTM D2216).
- Four (4) Atterberg limits tests (ASTM D4318).
- Seven (7) one-dimensional consolidation tests (ASTM D2435).
- Two (2) standard Proctor moisture density relationship tests (ASTM D698).
- Two (2) soaked one-point California Bearing Ratio (CBR) Test (ASTM D1883).

A summary of our laboratory testing procedures and the laboratory test results are included in Appendix C.

4. SITE CONDITIONS

S&ME's assessment of the geotechnical conditions began with a reconnaissance of the topography and physical features of the site. We also consulted available geologic maps and reports of nearby explorations for relevant information.

4.1 Surface Features

During the course of our exploration, we obtained design drawings for the adjacent Coliseum (called Memorial Hall at that time) dated October 1966. The structure is founded on shallow foundations with a bearing pressure of 3,000 psf. The lowest basement level on the north side of the structure is indicated to have a finished floor elevation of +223.67 ft. Based on these drawings and the site plans submitted to us, the horizontal distance between the south wall of the new structure and the north wall of the Coliseum appears to be on the order of 30 to 35 feet.

We also reviewed the grading plan for the Coliseum, which included pre-construction contours. Prior to construction, the site sloped downward from east to west, as it does now. Cuts of up to 22 feet were required in the northeast quadrant of the current site, near the bottom of the stairway from Assembly Street. As much as 10 feet of fill was required to grade the western portion of this site, with the deepest portion just north of the stairway adjacent to the Coliseum leading down to Park Street.

We also reviewed a Sanborn fire map obtained from Environmental Data Resources, Inc. dated 1950. The map shows that the site at this time, prior to construction of the Coliseum, consisted mainly of single-story residential dwellings. A Baptist church stood

on the corner of Park and Greene Streets with a two-story apartment building directly to the south. Two small roadways were used to access the central portion of the property from Assembly Street. It does not appear that any structures on the site at this time had basements.

A preliminary topographic survey of the site dated November 3, 2010, was provided to us by B.P. Barber. The site slopes downward to the west with elevations ranging from approximately +280 ft. near the corner of Greene and Assembly Streets to approximately +226 ft. in the southwest corner of the site. Elevations in the parking area in the central portion of the site vary from about +250 ft. to +252 ft. Based on the planned site grades, as much as 30 feet of cut will be required near the northeast corner of the structure while excavation for the basement and auditorium spaces will vary from a few feet on the downslope (west) portion of the site to in excess of 30 feet near the slope coming down from Assembly Street.

4.2 Local Physiographic Conditions and Geology

The site lies on one of several archaic river terraces that flank the Congaree River Valley both within and immediately south of the downtown Columbia area. Up to six such terraces have been mapped in the Congaree Valley. The terraces were formed over several periods in which the Atlantic Ocean intruded up the valley during warm periods of the Pliocene and Pleistocene Epochs. The lower terraces are relatively young features, exhibit only minor erosion, and can be traced large distances on the basis of surface elevation. The upper terraces, including areas adjacent to Columbia and West Columbia, have been severely eroded and have little surface expression. Each terrace forms a thin veneer over older, underlying Coastal Plain or Piedmont residual soils. Materials comprising the terraces typically consist of medium dense, coarse-grained red-brown clayey sands or stiff reddish sandy silts or clays with numerous rounded quartz pebbles embedded in the soil binder. The fine grained soil binder is typically well desiccated and oxidized and generally moderately preconsolidated. Under these conditions the soils are not highly compressible under light to moderate structural loads.

Terrace sediments are underlain by mostly sandy Cretaceous age sediments of the Black Mingo and Middendorf formations below approximately elevation 210 to 225 feet. These soils were eroded from a range of mountains in the northwest portion of the state approximately 65,000,000 years ago and laid down in their present positions as fan deposits, where they have weathered in place. In the Columbia metropolitan area these sediments rest unconformably on top of the underlying Piedmont rocks at depths of between 20 and 120 feet. Massive light gray or tan kaolin beds are prevalent thoughout the sequence, alternating with coarse-grained water-bearing sands and gravels which become increasingly prevalent near the base of the formation. Soil layers exhibit considerable lateral and vertical discontinuity. Iron-oxide cemented sandstone beds are common.

Soils of the Carolina Piedmont have weathered in place from the parent crystalline bedrock material and lie below approximately elevation 190 feet at the site. Residual soils of the Carolina Piedmont consist of stiff or very stiff micaceous silts and clays, grading to firm sands with depth. These soils have been completely weathered in place from the parent bedrock material, but below depths of a few feet retain most of the relict rock structure. Soil strength derives largely from relict intermolecular bonding and remolded materials generally less exhibit lower shear strength than do undisturbed samples. Piedmont soils are normally consolidated to slightly overconsolidated.

The term partially weathered rock (PWR) is applied to very dense micaceous sands, or silty sands of the Carolina Piedmont, which register SPT N-values in excess of 100 blows per foot. PWR generally varies widely within even small areas owing to minute differences in the chemical properties of the parent bedrock, which results in widely varying rates of weathering. Isolated lenses or seams of PWR often are present within Piedmont Residuum well above the overall PWR level within a given area. PWR is considered excellent bearing material for foundations and is relatively incompressible except in highly stressed deep foundations.

4.3 Interpreted Stratification of Soils on Site

Interpreted subsurface cross-sectional profiles of the soils encountered onsite are attached in Appendix A as Figure 3 through Figure 5. The orientation of the cross-sections in plan view is indicated on Figure 2. Subsurface conditions between the borings will likely vary from those indicated on our cross-section. The nature and extent of variations between the sampling points will not become evident until construction, and stratification lines shown are not warranted. For detailed descriptions and stratification at a particular boring location, the respective boring log should be reviewed. Soil test boring logs are attached in Appendix B.

4.3.1 Surface Material

Our borings were conducted in an existing asphalt parking area, through concrete sidewalks, and in landscaped areas. The borings in the parking area encountered approximately 1 to 6 inches of asphalt over 2 to 6 inches of stone base course. In the landscaped areas, our borings encountered approximately 3 to 6 inches of topsoil. The concrete sidewalks were measured to be approximately 4 to 6 inches thick at our boring locations.

4.3.2 Existing Fill

According to the Coliseum construction grading plan, as much as 10 feet of fill was required to grade the western portion of this site, with the deepest portion just north of the stairway leading down to Park Street. Existing fill was encountered in borings B-8, B-2, and B-7 to depths of 3 ft., 10 ft., and 12 ft., respectively. Where sampled, the fill generally consisted of clayey sands and sandy clays similar in character to the upper soils found across the site. Dry, brown poorly-graded sands were encountered near the bottom of the fill. In boring B-7, asphalt and stone debris was encountered with the sand. SPT

N-values ranged from 16 to 48 blows per foot (bpf), indicating a medium dense to dense relative density or very stiff consistency.

In addition to the fill placed during grading operations for the Coliseum, we expect up to 25 feet of fill to be encountered directly behind the Coliseum basement wall and in utility line cuts. A noticeable offset can be seen in the sidewalk on the north side of the Coliseum near where fill was likely placed to backfill the basement wall. No documentation of compaction or engineering control of the onsite fill has been made available and we do not expect these documents to be readily available. Although the boring data and recovered samples appear to indicate that the fill was placed with some level of engineering control during construction of the Coliseum, we cannot at this time independently verify compacted density achieved. The site was also developed prior to construction of the Coliseum, so the possibility exists that additional grading of the site took place prior to this time.

Though not encountered in our borings, there is a possibility that large debris (such as trash or old foundations) may be encountered within other areas of the site not penetrated by our borings. The extent of unsuitable debris within the building area will only be revealed when the area is exposed by site demolition. If encountered, this material will need to be removed and replaced with well-compacted fill free of foreign material.

4.3.3 Terrace Soils

Soils underlying the surface material and/or fill generally consisted of archaic river terrace clayey sands encountered above an elevation of about +225 feet on the east (upper) end and about +210 feet on the west (lower) end of the site. In the upper 10 feet of the stratum, recovered samples were generally dessicated, dry to moist, and mottled red with brown in color. SPT N-values in this zone were generally in excess of 30 bpf, indicating a dense relative density.

Below the upper 10 feet, the terrace soils generally graded to coarser sands with a lower proportion of clayey fines. These samples were generally moist and brown to orange or light red in color. In the northwestern portion of the site, the recovered samples were wet starting at an elevation of about +220 feet. Rounded gravel and angular quartz fragments, up to 2 inches in size, were also occasionally embedded in the soil binder near the bottom of the layer. SPT N-values generally indicated a medium dense to loose relative density, with increasing values noted near the bottom of the layer in gravel lenses.

Borings near the two eastern core locations (B-11 and B-14) encountered a lens of gravel to cobble-size rock fragments at about elevation +228 ft., near the bottom of the terrace sediments, extending for a thickness of about 3 to 4 feet. In that our drilling bit encountered refusal in these lenses, the gravel or cobbles may be upwards of 6 to 12 inches in size. These lenses are common in this area, with similar material encountered during construction of the nearby USC biomedical research campus.

Compression of the terrace sand stratum will comprise the majority of the settlement experienced under final load for those column footings that bear above the bottom of the stratum. We expect this compression to occur almost immediately after placement of load.

4.3.4 Coastal Plain Residuum

Below the river terrace soils, our borings encountered Cretaceous sands and clays, residual soils of the middle or upper South Carolina Coastal Plain, to elevations of about +195 ft. to +185 ft. These soils typically consisted of sandy kaolinitic clay grading downward to water-bearing clayey sands.

Recovered samples were typically micaceous, light gray with yellow or orange in color, and exhibited moderate to high plasticity when remolded by hand. SPT N-values in the upper clays were typically in excess of 30 bpf, indicating a hard consistency. SPT N-values in the lower sands were generally consistent with a medium dense to dense relative density.

Laboratory consolidation test data imply that these soils are preconsolidated under stresses at least 2-½ times the stresses now applied by the overburden. In our experience, this is typical for this formation and is due to desiccation or erosion of overlying materials over time. These soils can be considered relatively incompressible under applied stresses below the preconsolidation stress. Since the Cretaceous material is overconsolidated, compression due to deformation of soil grains will occur almost immediately after load application. Time-dependent compression due to primary consolidation and secondary compression will likely be very small.

4.3.5 Piedmont Residuum

Below the coastal plain residuum, our borings encountered piedmont residual soils which typically consisted of sandy silts to silty sands. Recovered samples were micaceous, white with yellow in color, and with fine to coarse sand and low to moderate plasticity fines. SPT N-values typically ranged from 30 bpf to greater than 100 bpf, indicating a hard to very hard consistency. Partially-weathered rock (PWR) was typically encountered within 10 feet of the top of the layer. Partially-weathered rock consisted of very hard/dense sandy silts to silty sands of the Carolina Piedmont which registered SPT N-values in excess of 100 bpf. The vertical and horizontal extent of PWR generally varies widely within even small areas owing to minute differences in the chemical properties of the parent bedrock, which results in widely varying rates of weathering. Isolated lenses or seams of PWR often are present within Piedmont Residuum well above the overall PWR level within a given area.

Auger refusal was encountered at elevations of about +170 ft. to +160 ft. on site. Refusal to drilling likely resulted from encountering either thin rock seams or the upper surface of sound bedrock.

The hard Piedmont silts and Partially Weathered Rock (PWR) encountered on site were considered as essentially incompressible under the anticipated column loads.

4.4 Ground Water

Ground water was encountered at elevations ranging from about +222 ft. to +205 ft. at the time of drilling. Most boreholes were backfilled after completion of drilling and measurement of the ground water level. Piezometers were installed in the boreholes of B-7 and B-10 to allow further monitoring of ground water levels.

From monitoring the piezometers, we did not encounter a significant change in stabilized ground water levels from November 2010 through February 2011. Piezometers will remain in place until the start of construction so that ground water levels can be further monitored.

We expect that ground water will be encountered during basement excavation perched near the terrace sand/kaolin clay interface. Given the downslope position of the site, inflow may be significant through gravel to cobble-sized rock seams encountered at this depth, especially if these lenses are recharged somewhere up the hill. If encountered during excavation, perched water can likely be controlled by ditching or placement of sumps and pumping. Perimeter wall drains and a permanent underslab drainage system, as described in Section 6.7, should be installed behind walls and below the basement floor slabs.

We note that ground water levels are influenced by precipitation, long term climatic variations, and nearby construction. Ground water measurements made at different times than our exploration may indicate ground water levels substantially different than indicated on the boring logs in Appendix B.

5. BUILDING CODE SEISMIC PROVISIONS

Seismic induced ground shaking at the foundation is the effect taken into account by building code seismic-resistant design provisions. Other effects, such as soil liquefaction, are not addressed in building codes but must also be considered.

5.1 Site Class

We classified the site as one of the Site Classes defined in the 2009 IBC Section 1613 (Table 1613.5.2) using the procedures described in Section 1613.5.2. The Site Class is used in conjunction with mapped spectral accelerations S_S and S_1 to determine Site Coefficients F_A and F_V in IBC Section 1613.5.3, tables 1613.5.3(1) and 1613.5.3(2).

The initial step in site class definition is a 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 under item 1) including quick and highly sensitive clays or collapsible weakly cemented soils, were not observed in the borings. Three other conditions, 2) peats and highly organic clays; 3) very high plasticity clays

(H>25 feet); and 4) very thick soft/medium stiff clays, were also not evident in the borings performed.

The remaining vulnerability, liquefaction, appears unlikely at this site due to the age of the soil deposits. This is discussed further in the proceeding section.

S&ME has performed shear wave velocity surveys of two nearby sites using surface wave analysis (MASW with MAM). During a previous exploration, we were also provided with shear wave velocity measurements using ReMi™ surface wave analysis of the adjacent chilled water plant site, performed by Mactec in 2005. The results of these surveys are provided below in Table 1:

Table 1: Summary of Shear Wave Velocity Testing in Project Vicinity

Project Location	Method	Average Shear Wave Velocity	IBC Site Classification
USC Biomed Research Campus	MASW/MAM	Array No. 1 = 1541 ft/s Array No. 2 = 1410 ft/s Array No. 3 = 1534 ft/s	Site Class C
USC Honors Dormitories	MASW/MAM	Array No. 1 = 1408 ft/s Array No. 2 = 1432 ft/s	Site Class C
USC Chilled Water Plant*	ReMi™	Array No. 1 = 1673 ft/s Array No. 2 = 1778 ft/s	Site Class C

* Measurements were not used for correlation and are provided for informational purposes only.

In assessing the Site Class for this site, we compared the subsurface profiles obtained at the Biomed and Honors Dormitories sites with conditions at this site. Soils encountered during this exploration were generally similar in character to those obtained at these other sites. A rough correlation was then made between boring data (SPT N-values) and shear wave velocity values for each geologic stratum encountered. The estimated weighted average shear wave velocity, v_{si}, from this correlation to a depth of 100 feet at this site exceeded 1200 feet per second. Based on this data and our knowledge of the general geologic profile of this area, IBC 2009 Site Class C represents conditions in and around the site.

5.2 Design Spectral Values

S&ME determined the spectral response parameters for the site using the general procedures outlined under the 2009 International Building Code Section 1613.5. This approach utilizes a mapped acceleration response spectrum corresponding to an earthquake having a 2 percent statistical probability of exceedance in 50 years to determine the spectral response acceleration at the top of seismic bedrock for any period. The 2009 International Building Code seismic provisions of Section 1613 use the 2002 Seismic Hazard Maps published by the National Earthquake Hazard Reduction Program (NEHRP) to define the base rock motion spectra.

The Site Class is used in conjunction with mapped spectral accelerations S_S and S_1 to determine Site Amplification Coefficients F_A and F_V in IBC Section 1613.5.3, tables 1613.5.3(1) and 1613.5.3(2). For purposes of computation, the Code includes probabilistic mapped acceleration parameters at periods of 0.2 seconds (S_S) and 1.0 seconds (S_1), which are then used to derive the remainder of the response spectra at all other periods. The mapped S_S and S_1 values represent motion at the top of seismic bedrock, defined as the Site Class B-C boundary. The surface ground motion response spectrum, accounting for inertial effects within the soil column overlying rock, is then determined for the design earthquake using spectral coefficients F_A and F_V for the appropriate Site Class.

The design ground motion at any period is taken as 2/3 of the smoothed spectral acceleration as allowed in section 1613.5.4. The design spectral response acceleration values at short periods, S_{DS}, and at one second periods, S_{D1}, are tabulated below for the unimproved soil profile using the IBC 2009 criteria. Peak ground acceleration (PGA) was obtained by dividing the S_{DS} value by 2.5.

Table 2: Spectral Design Values

	2009 IBC (2002 Seismic Hazard Maps)
S_{DS}	0.43 g
S_{D1}	0.16 g
PGA	0.17 g

Spectral response acceleration factors given above correspond to Design Category C for Use Group I, II, or III structures.

5.3 Liquefaction

Loose, sandy strata encountered in boring B-8 at depths of about 25 to 40 feet below ground surface appear to meet the general criteria for liquefaction, e.g. contain little fines, lie below the water table, and exhibit a loose relative density based on SPT N-values. However, empirical computations of liquefaction resistance based on SPT data do not account for the geologic age or origin of the deposit. In this case, use of the empirical charts would lead to very conservative results in terms of liquefaction susceptibility.

The effect of geologic age on the liquefaction susceptibility of a geologic formation was addressed in 1978 by Youd and Perkins[1]. Liquefaction potential decreases with increasing age of a soil deposit. Many processes occur with aging, such as cementation, weathering, increased exposure to low level shaking, cold-bonding and consolidation. All

[1] Youd, T. L., and Perkins, D. M. (1978), " Mapping Liquefaction-Induced Ground Failure Potential", Journal of Geotechnical Engineering, ASCE, Vol. 104, No. GT4, pp. 433-446.

of these processes tend to increase the liquefaction resistance of soils, but their effect can usually not be captured by penetration tests due to disturbance of the soil matrix during sampling.

In this case, the site is underlain by materials substantially older than considered susceptible to liquefaction by researchers. Nearly all known liquefaction features considered in the literature occur in Holocene-age strata (less than 11,000 years). Paleo-liquefaction features, or evidence of past liquefaction occurrence, have been discovered in the early Pleistocene-age (Q3 or younger) deposits of the lower coastal plain in South Carolina in connection with the 1886 Charleston earthquake, but not in any older terrace deposits within the study area around Charleston. Regional geologic mapping in the area indicate the terrace deposits to likely consist of Pliocene-era sediments laid down in excess of 1.8 million years ago. Soils of this age are considered very unlikely to experience liquefaction.

S&ME's opinion is that while liquefaction is computationally possible in scattered locations based on blow-count based empirical methods, these methods are not necessarily applicable to this site. It is our opinion that liquefaction does not represent a creditable geologic hazard for the design earthquake required by the 2006 IBC.

6. CONCLUSIONS AND RECOMMENDATIONS

Based on the recent topographic survey and the condition survey prior to construction of the Coliseum, it appears that as much as 10 feet of fill was required to grade the western portion of this site to present surface elevation. The deepest portion lies just north of the stairway leading down to Park Street. The cut/fill line appears to run generally along the western edge of the parking area. The recommendations given below for site preparation and for foundation and grade slab construction are dependent on the nature and extent of existing fill soils on site. For our recommendations given below to remain valid, prior to construction of grade slabs or foundations a representative of S&ME must evaluate the suitability of existing fill soils where encountered.

The following paragraphs include our conclusions and recommendations for site preparation, for fill placement and compaction, and for foundation types and design values. The conclusions and recommendations included in this report are based on our sampling of representative soils, on the information obtained during our subsurface exploration and on our experience with similar projects.

6.1 Site Preparation

The soil profile encountered at this site will likely require some modification before foundation construction begins. The following recommendations illustrate the site preparation requirements anticipated during construction on this site:

1. Site preparation should include the removal of all unsuitable surface materials within the building footprint. Strip and grub all existing vegetation and topsoil as

well as asphalt pavements. Stripped asphalt should be disposed of outside the perimeter of the new building footprint.

2. Old foundations or basement slabs, if encountered during site preparation, should be completely removed where they interfere with new construction. Undercut basements or pits should be backfilled with well-compacted structural fill, in accordance with Section 6.3. In addition, abandoned utilities should be removed or plugged prior to construction. If not removed or plugged, pipes may serve as conduits for subsurface erosion resulting in formation of voids below foundations or floor slabs. Where existing utilities are left in place and plugged within the building footprint, it may be necessary to undercut poorly-compacted utility backfill to provide adequate support for new footings or slabs. Existing utilities remaining in use should be rerouted around the proposed building footprint.

3. Avoid placing construction debris from the existing structures in the new building footprint. You may place broken concrete or asphalt material in fill portions of pedestrian or landscaped areas, provided no environmental regulations are thereby violated.

4. After stripping and cutting to grade elevation and undercutting of unsuitable material in the building footprint, the exposed subgrade where space permits should be proofrolled with a heavily loaded tandem-axle dump truck or similar rubber-tired equipment to identify areas that require stabilization. A representative of S&ME must be present during this evaluation. Assuming our recommendations for site preparation are followed, we do not expect widespread stabilization will be necessary unless surface soils are heavily reworked or allowed to become saturated during construction.

5. Existing fill soils, where encountered during site preparation, should be closely evaluated to determine their suitability for structural support. Such an evaluation may consist of visual observations, test pits, and hand auger borings with Dynamic Cone Penetrometer testing, in addition to proofrolling. A representative of S&ME must be present during this evaluation. Fill soils placed without engineering control may include organics, buried debris, or voids which could not be observed during our exploration. Existing fill soils that are not suitable for structural support should be replaced with well-compacted structural fill, in accordance with Section 6.3. As with any previously developed site, unexpected conditions will likely be encountered.

6. It will be necessary to provide sufficient drainage of water away from the building pad to protect the subgrade. Even during 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 sealing the ground with rubber tire or steel drum equipment to help prevent

rainwater runoff from migrating below the surface soils. During construction, gravity-drained surface ditches should be installed around the site to promote surface runoff. Ditches should have at least six inches of relief per 100 feet of length to facilitate flow.

6.2 Site Excavation

Based on the planned site grades, as much as 30 feet of cut will be required near the northeast corner of the structure while excavation for the basement and auditorium spaces will vary from a few feet on the downslope (west) portion of the site to in excess of 30 feet near the slope coming down from Assembly Street. The boring data indicate that excavation will extend mainly through moderate consistency river terrace sands with gravel to cobble-sized rock lenses. Perched ground water will likely be encountered during basement excavation near the terrace sand/kaolin clay interface. Ground water, if encountered during site excavation, should be reduced and maintained at least 2 feet below the bottom of excavations prior to and during digging. Ground water levels should be maintained below the bottom of the excavation until the weight of the concrete placed is sufficient to overcome the uplift force of the groundwater.

Substantial cuts will be necessary adjacent to Assembly Street in the eastern portion of the site. Cuts near the existing retaining wall along Assembly Street may reach 35 feet in depth. Temporary excavations should be sloped or shored in accordance with local, state, and federal regulations, including OSHA (29 CFR Part 1926) excavation trench safety standards. The contractor is usually solely responsible for site safety. This information is provided only as a service and under no circumstances should S&ME be assumed to be responsible for construction site safety.

6.3 Fill Placement and Compaction

The clayey sands and sandy clays in cut areas of the site are likely suitable for re-use as structural fill. Sandy clays encountered in the river terrace stratum and some of the more cohesive clayey sands will be difficult to work with if allowed to become wet and will likely require moisture conditioning procedures during placement. These soils may not provide adequate support under footings or grade slabs if placed too wet of optimum.

All fill placed should be comprised of soils free of organic matter and other deleterious materials. The fill should be uniformly spread in relatively thin lifts (8 inches, loose) and compacted to at least 98 percent of the soil's maximum dry density as determined by a laboratory standard Proctor compaction test (ASTM D-698). The moisture content should be controlled to within plus to minus 3 percent of optimum. 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. In areas where less than 12 inches of new fill will be placed, the upper 8 inches of the existing material should be compacted to at least 98 percent of the soils maximum dry density per ASTM D-698.

After fill operations are complete, the exposed building pad surfaces should be again proofrolled under the supervision of the geotechnical engineer or his representative with a heavily loaded truck or pan. Areas of rutting or pumping soils may require selective undercutting or further stabilization prior to construction of building slabs.

6.4 Recommendations for Foundation Support

6.4.1 General Recommendations

Based on the results of our exploration, experience in the area, and the provided plans, shallow foundations appear suitable for support of the proposed structure. Shallow foundations may consist of spread footings supporting isolated columns, mat footings for supporting large area loads, combined footings for supporting loads from several columns, or strip footings for supporting walls. This assumes that the site preparations outlined above are followed and the estimated total and differential settlements given below can be tolerated by the structure.

The load differentials across bay spacings and somewhat irregular footing configurations and bearing elevations increase the potential for differential settlements to occur that push structural tolerance. The loads associated with the core shaft footings are also at the higher end for recommendations we have given in the past for shallow foundation support in downtown Columbia. Therefore, our recommendations given below will remain valid only if all excavated footings are examined by an S&ME representative prior to concreting to ensure that bearing soils are similar to what was encountered in our borings and that unsuitable soils have been removed from the footing subgrades.

It appears that most if not all foundations for the structure will bear on virgin soils. Assuming the western portion of the site is excavated to approximately El. +230 ft. for Level 0, and footings adjacent to the basement wall sunk to suitable elevations, most of the existing fill on site will likely be removed. However, the possibility exists that existing fill soils will be encountered near bearing depths in areas of the site not explored by our borings. The recommendations given below for foundation design are dependent on the nature and extent of existing fill soils on site. Prior to construction of foundations, a representative of S&ME must evaluate the suitability of existing fill soils where encountered at footing bearing depth.

Footings constructed near the Coliseum basement wall and adjacent to basement walls will impose lateral surcharge loads on the walls unless they are extended to sufficient depth. We recommend that footings in these areas be extended to bear at a depth such that a line projected downward at a 45 degree angle from the outer toe of the footing does not intersect the wall footing. Based on the plans provided to us, it does not appear that the footings along the southern wall will impose surcharge loads on the Coliseum wall using the method described above.

6.4.2 Allowable Bearing Pressure

We estimated bearing capacities for various foundation dimensions using our boring data and our experience with similar soils under similar loading conditions. Estimated ultimate bearing capacity exceeds recommended allowable bearing pressures by a safety factor of at least 3.0, provided that footings are designed and constructed as outlined in this report.

A net bearing pressure of 5,000 psf or less is recommended for core footings, assuming they bear at or below an elevation of about +224 ft. A net bearing pressure of 5,000 psf or less is recommended for column footings that bear at or below an elevation of +230 ft. This would include the columns within the Level 0 and Auditorium footprints. A net bearing pressure of 3,000 psf or less is recommended for Level 1 footings that are not adjacent to basement walls. Footings adjacent to core and basement walls should be extended to bear at a depth such that a line projected downward at a 45 degree angle from the outer toe of the footing does not intersect the wall or core footing. Based on our rough measurement, we expect that these footings would have to bear at an elevation of +234 ft. or below to meet this requirement. For these footings, a net bearing pressure of 3,000 psf or less is recommended if the bearing elevation is approximately +234 ft. A net bearing pressure of 5,000 psf or less is recommended if the footings are extended to bear at or below an elevation of +230 ft. Recommended allowable bearing pressures may be increased by 1/3 for transient conditions, such as wind or seismic loads.

6.4.3 Bearing Depth and Dimension

Minimum individual spread footing and wall footing widths should be at least 24 and 18 inches, respectively, with a minimum embedment depth of 24 inches below final grade. This recommendation is made to help prevent a "localized" or "punching" shear failure condition that could exist with very narrow footings.

6.4.4 Settlement

Using our subsurface data and the building information provided to us, the structural load and soil response were modeled using *Settle3D*™ version 2.01 by Rocscience, Inc. Response at the four core locations and the auditorium/lecture hall space was modeled using multiple column loads and the full soil profile. Unloading effects from the planned excavations were included in the model.

As part of our May 2011 exploration, laboratory one-dimensional consolidation tests were performed on seven relatively undisturbed samples recovered from the river terrace sands and underlying Cretaceous-age material. Graphical presentation of sample deformation at 100 percent consolidation versus load, expressed as void ratio, are presented for the samples in the laboratory data sheets attached in Appendix C. The graphical representation of the sample load-deflection curves was corrected for sample disturbance using the Schmertmann (1955) approach and the Becker (1997) work per unit volume approach. In-place vertical stresses were estimated to be in the range of 1.5 ksf to 5.5 ksf, depending on the sample depth.

Corrected data imply a preconsolidation stress on the order of 10 ksf in the Cretaceous-age materials, or roughly 2.5 times the stresses now applied by the overburden. Re-compression index (C_R) values below the preconsolidation stress were approximately 0.01, while virgin compression (C_c) index values ranged from 0.13 to 0.19 in the upper terrace sands and 0.06 to 0.09 in the Cretaceous clays and sands. Coefficient of consolidation (C_V) varied from about 1.3 to 17.0 ft^2/day in the Cretaceous material at stresses between the in-situ stress and the anticipated stress increase. In our analysis, a linear elastic deformation model was assumed for the upper terrace sands while a non-linear time-dependent model was assumed for the Cretaceous clays and sands.

Based on our subsurface data and the resulting models, we expect the cores to settle on the order of ½ to 1 inch total, with approximately 50 percent of the settlement occurring due to the self-weight of the core shell. This assumes a 5,000 psf bearing pressure and excavation to elevation +230 ft. The added weight of the core footing was neglected because the net load caused by replacing excavated soil with concrete is small compared to the expected structural loads. Settlement of the remaining columns is also expected to be on the order of ½ to 1 inch total. Based on our model, we expect higher settlements will be seen in the column footings that bear at higher elevations in the upper terrace sands. This material is generally not as stiff as the underlying Cretaceous-age clays and unloading effects caused by excavation will be small to non-existent. A further breakdown of estimated settlements calculated at various locations using various footing configurations is attached in tabular form in Appendix A. The settlement values are broken down into (nearly) immediate settlement and total settlement including time-dependent effects.

Considering a "beam on elastic subgrade" or Winkler approach in design of mat foundation reinforcing, a modulus of subgrade reaction of 25 lbs./in^3 may be assumed for computation of soil resistance to beam deflection.

6.4.5 Construction Sequencing and Monitoring

Although we expect settlement of the cores to be 1 inch or less given the assumptions described above, our estimate is highly dependent on unloading effects from removing approximately 22 feet of overburden soil from the core area. This phenomenon is difficult to predict and the response does not always match the theoretical models, especially if the excavation is relatively confined as it is with this project. Therefore, we recommend that the core footings and shell be constructed to full height before the remaining structural frame is attached. Settlement points should be established near the base of the cores and monitored for the duration of core construction. Attachment of the structural frame should not start until core settlements have essentially ceased. The geotechnical engineer of record, S&ME, must be retained to make this determination after review of settlement data. Our laboratory results suggest that no special wait period will be necessary after the cores are constructed, assuming it takes at least 45 days to cast the core columns to full height.

In order to construct the basement walls, excavations will have to be sloped back to comply with OSHA requirements. This may result in column footings, extended to bear at low elevations, where overburden is first removed then replaced to Level 1 grade. This will impose loads in addition to the structural loads associated with each footing. Therefore, we recommend that all backfilling activities behind basement walls be completed before structural connections are made to the columns in backfilled areas.

6.4.6 Foundation Lateral Capacity

Lateral capacity of footings includes a soil lateral pressure and coefficient of friction as described in IBC Section 1806. Footings will likely be embedded in material similar to those described as class 4 as described in Table 1806.2. Where footings are cast neat against the sides of excavations in natural soils or well-compacted fill, an allowable lateral bearing pressure of 150 psf per foot depth below natural grade may be used in computations. An allowable coefficient of friction of 0.35 at the base of the foundations may be used in the calculation of sliding resistance, assuming concrete cast directly against undisturbed virgin soil or existing fills similar to those encountered in our borings, or approved granular fill. An increase of one-third in the allowable lateral capacity may be considered for load combinations, including wind or earthquake, unless otherwise restricted by design code provisions.

6.4.7 Construction and Observation of Footings

The recommendations given above assume proper design and construction of the footings and that the site preparation recommendations given herein are followed. All excavated footings must be examined by an S&ME representative prior to concreting to ensure that bearing soils are similar to what was encountered in our borings and that unsuitable soils have been removed from the footing subgrades. Existing fill should be evaluated when encountered on a case by case basis. Where existing fill underlies footing subgrades, it may be necessary to remove and replace poorly compacted or debris laden fill with well-compacted structural fill. It also may be necessary to redesign footings in the field (e.g. widen or deepen footings) based on observed conditions.

When possible, concrete should be placed the same day footings are excavated to the planned bearing elevations. If footings must remain open overnight or if rainfall is imminent, place a 2 to 4-inch thick "mud-mat" of "lean" (2000 psi) concrete on the bearing soils before placing rebar. Remove soils softened by water intrusion or exposure before placing concrete.

6.4.8 Lightweight Backfill

Assuming a 5,000 psf bearing pressure is used for the core shafts, a mat foundation on the order of 30 ft. by 30 ft. would be required for the provided loads. Because this is larger than the bay spacing of 21 ft., a portion of the foundation will extend out and under the core/basement walls. Adding approximately 26 ft. of soil backfill atop a portion of the foundation may result in excessive bending stress. A lightweight aggregate, such as

STALITE, would lower this stress while providing some weight for overturning resistance. Any lightweight aggregate used should be structurally stable under the applied loads and wrapped in filter fabric to reduce contamination of the aggregate.

6.5 Grade Slab Support and Construction

After cut and fill placement operations are completed to achieve subgrade elevation for the building pad, the exposed surface should be proofrolled with a heavily loaded dump truck or pan. A representative of S&ME must be present during this evaluation. Areas of rutting or pumping soils may require selective undercutting or further stabilization prior to placement of the slab. Prior to construction of grade slabs, a representative of S&ME must also evaluate the suitability of existing fill soils where encountered.

Virgin soils or existing fill soils similar to those encountered in our borings, or new fill placed and compacted in accordance with Section 6.3, will provide adequate support to proposed soil-supported grade slabs. A modulus of subgrade reaction (k) of 200 psi/in may be used for reinforcing design, assuming a subgrade consisting of compacted soils without segregation by composition.

Place a blanket of at least 4 inches of compacted granular soils below slabs to provide a capillary break between the subgrade and the slab concrete. Soil used as capillary break material should contain 5 percent or less of fines passing the No. 200 sieve. A vapor barrier such as "Visqueen," or the equivalent, is advised for placement beneath the slabs to limit moisture infiltration into finished spaces. The vapor barrier should be placed below the capillary break material. In addition, provide joints in slabs around columns and along wall footings to accommodate minor differential settlements.

6.6 Retaining Wall Earth Pressures

The equivalent fluid pressures given below should be used to design proposed basement walls and retaining walls on site. We recommend that the "At rest" lateral earth pressure coefficient be used if the walls are restrained from rotation and that the "Active" lateral earth pressure coefficient be used if rotation is not restrained. Note that basement walls lower than 8 feet high are not considered relatively rigid or restrained walls. In addition to the lateral loads exerted by the soil against the walls, allowance should be included for lateral stresses imposed by any temporary or long-term surcharge loads, such as cars or trucks adjacent to the walls.

The values given in the following table assume placement and compaction of the backfill in accordance with Section 6.3. These values assume backfill generally classified as SC soils, according to the Unified Soil Classification system, as described in Table 1610.1 of the 2009 IBC. The static values in Table 4 are based on a moist unit weight of 120 pcf and a friction angle (ϕ) of 32 degrees.

Table 4: Equivalent Fluid Pressures for Retaining Walls

Support Condition	Equivalent Fluid Pressure (drained, level backfill)
Active Condition (Wall deflects laterally, as with a conventional cantilevered retaining wall)	40 pcf
At-rest Condition (Wall restrained from movement, as with a basement wall)	60 pcf
Passive Condition (Wall movement toward retained soil, as with a thrust block)	290 pcf
Coefficient of Sliding Friction (Tan δ)	0.35

1) An allowable maximum toe pressure of 5,000 psf may be used for planned basement walls. Note that this applies to pressures at the edge of the wall footing, not an average value across the footing.

2) The above values represent a fully-drained soil condition, as defined in IBC 2009 Section 1805.4.2. Where backfill soils are not drained using an appropriately designed toe drainage system, the lateral soil pressure must consider hydrostatic forces below the surface, and submerged soil unit weight.

3) Basement walls lower than 8 feet high are not considered relatively rigid or restrained walls.

4) Organic silts (OL or OH), inorganic elastic silts (MH), or inorganic highly plastic clays (CH) soils may not be used as backfill.

5) Footings near proposed basement or retaining walls will impose surcharge loads in addition to earth pressures tabulated above if not extended to sufficient depth. Alternatively, you may elect to extend footings to bear entirely below a line 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.

6) Compact backfill directly behind walls with light, hand-held compactors. Heavy compactors and grading equipment should not be allowed to operate within 10 feet of the walls during backfilling to avoid developing excessive temporary or long-term lateral soil pressures.

6.7 Perimeter and Underslab Drains

Positive gravity drainage of basement wall backfill should be provided using a permanent toe drain to limit buildup of hydrostatic pressures in the backfill. Gravity drainage should 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.

We recommend that underslab drains be installed on roughly 10 to 20 foot centers below the basement slab to intercept infiltrating groundwater not collected by the wall toe drain. The interior drains should be embedded in the stone base layer immediately below the floor slab. A non-woven geotextile fabric should first be placed on the slab subgrade. Once the fabric has been placed, perforated pipe (6 inches in diameter) should be installed atop a minimum 1-inch layer of washed aggregate (No. 57 stone) then additional stone placed atop the pipe. The perforated drain pipe should also be wrapped in a suitable geotextile sock.

We expect the underdrain system can be designed to connect with a catch basin in the general vicinity of the drain system. The underdrain system should drain by gravity toward the catch basin. Interior drains should be cross-connected between one another and into the perimeter toe drains at several locations. Provision should also be made for clean out ports at several locations within the basement to facilitate maintenance of the system over time.

6.8 Pavement Recommendations

Two soaked laboratory California Bearing Ratio (CBR) tests were performed on representative bulk samples obtained at depths of approximately 1.0 to 2.5 feet below the existing ground surface at the locations shown on the attached Figure 2. The samples were compacted (remolded) to approximately 97 percent of the standard Proctor maximum dry density near the optimum moisture content.

Based on the laboratory test results and considering the total soil profile affected by wheel loads, a CBR value of 3 percent is recommended for use at the Park Street drop-off while a CBR value of 8 percent is recommended for use at the Greene Street drop-off. This is assuming that pavement subgrades are prepared in accordance with Section 6.1 of our geotechnical report and that the upper 12 inches of subgrade material is compacted to at least 97 percent of the standard Proctor maximum dry density. This also assumes that any fill material placed within the proposed pavement areas is placed and compacted according to the recommendations given in Section 6.3 of our report. Imported fill should be tested to determine that it exhibits a CBR equivalent to or exceeding the value assumed in pavement design.

Design procedures are based on the AASHTO Guide for Design of Pavement Structures and associated literature. Based on the subsurface conditions and assuming our grading recommendations will be implemented as specified, the following presents our recommendations regarding typical pavement sections and materials.

6.8.1 Flexible Pavements

Our pavement analysis was performed using DARWin Pavement Design and Analysis System software. DARWin uses the AASHTO '93 Flexible Pavement Design Method

for analysis of the unreinforced pavement section. Structural design DARWin input data included an initial serviceability of 4.2, a terminal serviceability of 2.0, a reliability level of 75 percent, and an overall standard deviation of 0.45.

Traffic volumes were not made available as of the writing of this report, therefore assumed traffic volumes based on our experience with similar facilities have been used in analysis. These assumed values are not guaranteed to represent the actual traffic volumes. If actual traffic volumes differ from those assumed, the recommended pavement sections should be re-evaluated. The following assumptions were used for traffic volume:

Normal Duty Asphalt (No heavy truck traffic):

- A design life of 20 years with 22,000 Equivalent Single Axle Loads (ESAL) over the design life.
- Average Daily Traffic of 150 passenger cars per day with 0.006 ESAL per vehicle (seven days per week).
- Two single-unit delivery trucks per day with 1.5 ESALs per truck (office deliveries - five days per week).

Heavy Duty Asphalt Drive:

- A design life of 20 years with 45,000 Equivalent Single Axle Loads (ESAL) over the design life.
- Average Daily Traffic of 150 passenger cars per day with 0.006 ESAL per vehicle (seven days per week).
- Four single-unit delivery trucks per day with 1.5 ESALs per truck (five days per week).
- Two garbage trucks per week with 2.5 ESALs per truck.

It is our opinion that the flexible pavement should consist of a wearing course of hot mix asphaltic (HMA) concrete and a base course of graded aggregate material. Graded aggregate material is necessary for structural support and to help transport any rainwater that seeps below the pavement. The results of our design are summarized in the following table.

Table 5 – Recommended Flexible Pavement Section Thickness

Design Life ESAL (20 Years)	Graded Aggregate Base Course	Asphalt Binder Course	Asphalt Surface Course
Normal Duty - 22,000 ESALs (Passenger cars & light-duty trucks)	6.0 in.	-	2.0 in.
Heavy Duty – 45,000 ESALs (With heavy trucks)	6.0 in.	1.5 in.	1.5 in.

Pavement materials should conform with and be placed in accordance with the South Carolina DOT Standard Specifications for Highway Construction for Type 1 or Type C asphalt. The aggregate base course should consist of Macadam Base Course (Refer to SCDOT 2007 Standard Specifications). This base course should be compacted to at least 100 percent of the maximum dry density, as determined by the modified Proctor compaction test (ASTM D 1557-90 or AASHTO T 180-90). To confirm that the base course has been uniformly compacted, in-place field density tests should be performed by a qualified materials technician, and the area should be methodically proofrolled under his evaluation.

Although our analysis was based on a 20 year design life, our experience indicates that an overlay may be needed in approximately 7 to 10 years due to normal weathering of the asphaltic concrete. Also, some areas could require repair in a shorter time period.

6.8.2 Rigid Pavements

A rigid pavement consisting of reinforced concrete, and constructed in accordance with recommendations made in this report, is preferred for areas subject to repeated, heavy traffic loads. We also recommend that rigid concrete pavement be used for dumpster pads and in front of dumpster areas to help resist the damage caused by traffic with heavy static loads. DARWin's Pavement Design and Analysis System software has been utilized for rigid pavement recommendations. Our recommendations are based on the assumption that the subgrade has been prepared in accordance with Section 6.1 of our geotechnical report. Estimation of rigid pavement thickness assumed a 20 year design life, 80 percent reliability, 4.2 initial serviceability index and a 2.0 terminal serviceability index. Rigid pavement design used an overall standard deviation of 0.35 and assumed plain jointed concrete with a compressive strength of 4,000 psi at 28 days. Based on empirical relationships with CBR values and our past experience, a modulus of subgrade reaction of 125 pci was used for design. The load transfer coefficient, J, was estimated as 2.8, assuming dowels are installed as described below.

Based on these values, we recommend the following rigid pavement section:

Table 6 – Rigid Pavement Design

Pavement Materials	Thickness (in.)
4,000 psi Type I Concrete	6.0
Compacted Crushed Aggregate Base	4.0

Rigid pavement sections should be designed and constructed in accordance with appropriate American Concrete Institute (ACI) recommendations and with the applicable specifications of the South Carolina Department of Transportation Standard

Specifications for Highway Construction (2007 edition). The following comments should be considered for the recommended concrete pavement sections.

- All rigid pavements should be constructed with an aggregate base to reduce the potential for pumping through expansion or contraction joints. Soils such as those encountered on site are typically considered prone to pumping where infiltration of surface water through the pavement occurs often.

- Rigid pavement should extend in front of the dumpster pad such that the front tires of the truck are resting on the pad during unloading of the dumpster.

- Contraction joints should have a maximum spacing of about 30 times the thickness of the concrete slab, as per ACI. Individual concrete pavement panels should have length to width ratios (l/w) within the following range; $1.0 \leq l/w \leq 1.25$.

- An adequate number of smooth steel dowels should be provided at all expansion and contraction joints in areas expected to receive repeated heavy traffic loading. All dowels should be coated and lubricated and affixed with metal or plastic caps. The size and spacing of dowels should conform to ACI recommendations (see Section 3.8, ACI 330R-08).

- Isolation joints should be included for concrete pavement areas that abut fixed objects such as around light poles, curb inlets, etc. Preformed expansion joint material should extend the full depth of the pavement.

- Curb and gutter construction joints should match the joints scheduled in the pavement.

- Nominal steel reinforcement should be provided in the concrete slabs with length to width (l/w) ≥ 1.25 and non-rectangular shaped slabs to reduce cracking.

- All joints should be sealed with a flexible fuel resistant sealer, in accordance with SCDOT Section 501.2.6, to minimize surface water infiltration into the prepared sub-base. Joint reservoir should contain poly backer rod to prevent fine soils from entering the joint sawcut.

6.8.3 Subgrade and Drainage

Pavement performance is very dependent on subgrade condition. Drainage will have a major impact on subgrade condition. Drainage should be designed to result in subsurface water levels being at least 2 feet below the top of the pavement subgrade. Design should not result in water standing on the pavement surface or behind curbing. Design should result in positive drainage being available from the stone base material.

The performance of the pavement will be influenced by a number of factors including the actual condition of subgrade soils at the time of pavement installation, installed thicknesses and compaction, and drainage. The subgrade soils should be re-evaluated by proofrolling immediately prior to placement of base course stone and any unstable areas repaired. This recommendation is very important to the long-term performance of the pavements and slabs. Areas adjacent to pavements (embankments, landscaped island, ditching, etc.) which can drain water (rainwater or sprinklers) should be designed so that water does not seep below the pavements. This may require the use of French drains or swales. Sufficient tests and inspections should be performed during pavement installation to confirm that the required thickness, density, and quality requirements of the specifications are followed.

7. LIMITATIONS OF REPORT

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

The analyses and recommendations submitted herein are based, in part, upon the data obtained from the subsurface exploration. The nature and extent of variations between the borings will not become evident until construction. If variations appear evident, then we will re-evaluate the recommendations of this report. In the event that any changes in the nature, design, or location of the proposed structure are planned, the conclusions and recommendations contained in this report will not be considered valid unless the changes are reviewed and conclusions modified or verified in writing.

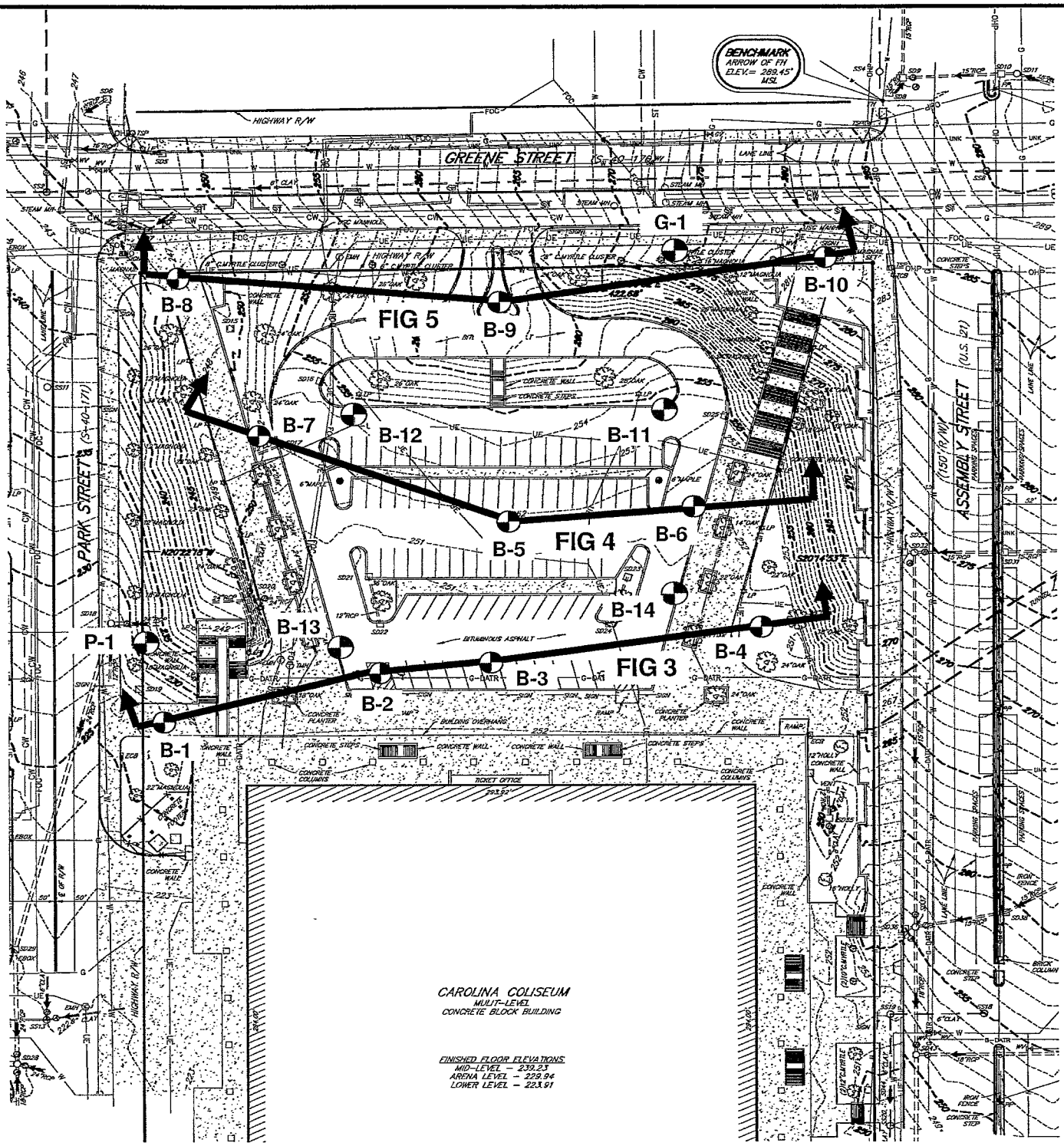
We recommend that S&ME, Inc. be provided the opportunity to review the final design plans and specifications in order to ensure that earthwork and foundation recommendations are properly interpreted and implemented.

APPENDIX A

SOURCE: Google Earth

NOTE: Other sites noted on map are explorations conducted by S&ME or by others & provided to S&ME.

SCALE: NTS	S&ME	**SITE VICINITY MAP** Darla Moore School of Business Columbia South Carolina	FIGURE NO:
CHECKED BY: JCL			1
DRAWN BY: MCG			
DATE: 12/9/10		JOB NO. 1611-10-426	



N

APPROXIMATE SPT BORING LOCATION (November 2010)

APPROXIMATE UD SAMPLE LOCATION (May 2011)

APPROXIMATE BULK SAMPLE LOCATION (April 2011)

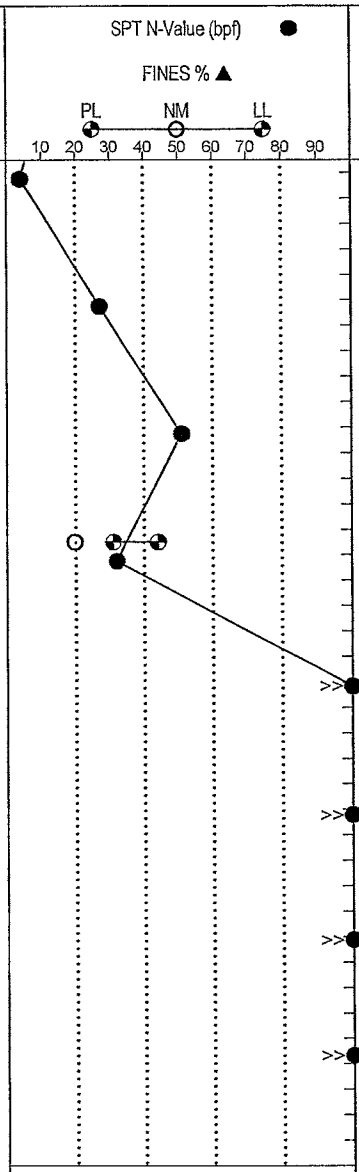
SOURCE: B.P. Barber

SCALE:	NTS	S&ME	**BORING LOCATION PLAN**	FIGURE NO.
CHECKED BY:	JCL		Darla Moore School of Business	2
DRAWN BY:	MCG		Columbia, South Carolina	
DATE:	10/12/2011		JOB NO. 1611-10-426rev1	

PROJECT: Darla Moore School of Business Columbia, SC S&ME Project No. 1611-10-426	BORING LOG: B-5

DATE DRILLED: 11/9/10	ELEVATION: 252.0 ft	NOTES: Elevations estimated from provided site topographic plan. No survey of boring locations or elevations conducted by S&ME.
DRILL RIG: CME 45-B	BORING DEPTH: 88.0 ft	
DRILLER: Wessinger	WATER LEVEL: 46.6 ft. @ TOB	
HAMMER TYPE: Safety	LOGGED BY: M. Glunt	
SAMPLING METHOD: Split spoon		NORTHING: / EASTING:
DRILLING METHOD: 2¼" H.S.A.		

DEPTH (feet)	MATERIAL DESCRIPTION	ELEVATION (feet-MSL)	SAMPLE NO.	SAMPLE TYPE	BLOW COUNT / CORE DATA 1st 6in / RUN #	2nd 6in / REC	3rd 6in / RQD	4th 6in	N VALUE
50	**POORLY-GRADED SAND with CLAY (SP/SC)** mostly fine to medium sand, few low to medium plasticity fines (thin kaolin seams), very loose, wet, light red with white.	202.0	12		8	3	1		4
55	**CLAYEY SAND (SC)** mostly medium sand, some medium plasticity fines (interbedded kaolin seams), medium dense, wet, light brown with red and light gray.	197.0	13		9	10	17		27
60	**SANDY SILT (ML)** mostly low to medium plasticity fines, some fine to coarse sand, micaceous, very hard, white with tan and red [PIEDMONT RESIDUUM].	192.0	14		12	19	32		51
65	- - - With fine angular quartz fragments, hard.	187.0	15		21	17	15		32
70	**PARTIALLY WEATHERED ROCK sampled as SANDY SILT (ML)** mostly low plasticity fines, some fine to coarse sand, with fine angular quartz fragments, micaceous, very hard, moist, white with tan.	182.0	16		20	39	50/4"		>> 50/4"
75		177.0	17		23	41	50/5"		>> 50/5"
80	**PARTIALLY WEATHERED ROCK sampled as SILTY SAND (SM)** mostly fine to coarse sand, some low plasticity fines, with fine angular quartz fragments, micaceous, very dense, moist, white with tan.	172.0	18		21	43	50/3"		>> 50/3"
85		167.0	19		50/4"				>> 50/4"
	- - - Auger Refusal at 88.0 ft. Boring terminated at 88 feet								



S&ME BORING LOG - VOGTLE DMSB BORING LOGS.GPJ S&ME 2009_09_24.GDT 12/10/10

NOTES:

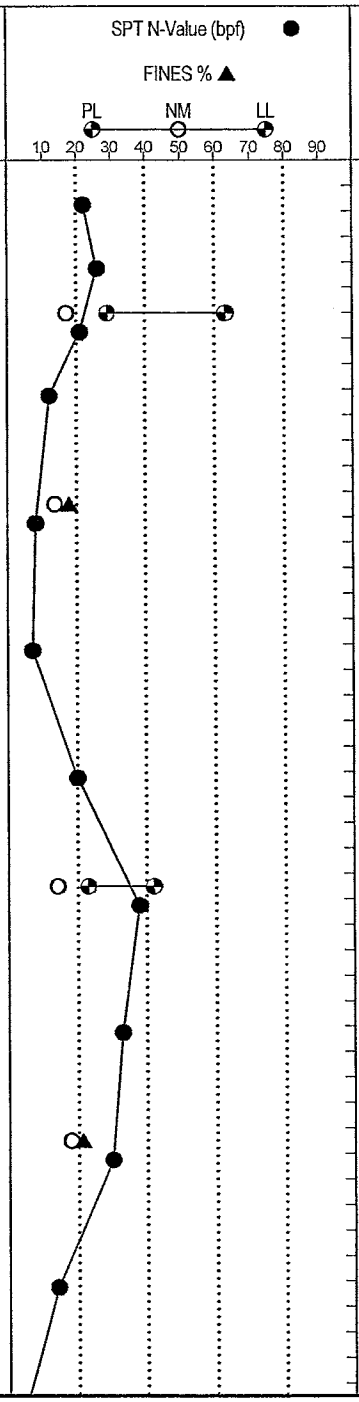
1. *THIS LOG IS ONLY A PORTION OF A REPORT PREPARED FOR THE NAMED PROJECT AND MUST ONLY BE USED TOGETHER WITH THAT REPORT.*
2. *BORING, SAMPLING AND PENETRATION TEST DATA IN GENERAL ACCORDANCE WITH ASTM D-1586.*
3. *STRATIFICATION AND GROUNDWATER DEPTHS ARE NOT EXACT.*
4. *WATER LEVEL IS AT TIME OF EXPLORATION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

S&ME

PROJECT:	Darla Moore School of Business Columbia, SC S&ME Project No. 1611-10-426	BORING LOG: B-5
DATE DRILLED: 11/9/10	ELEVATION: 252.0 ft	NOTES: Elevations estimated from provided site topographic plan. No survey of boring locations or elevations conducted by S&ME.
DRILL RIG: CME 45-B	BORING DEPTH: 88.0 ft	
DRILLER: Wessinger	WATER LEVEL: 46.6 ft. @ TOB	
HAMMER TYPE: Safety	LOGGED BY: M. Glunt	
SAMPLING METHOD: Split spoon		NORTHING: / EASTING:
DRILLING METHOD: 2¼" H.S.A.		

DEPTH (feet)	MATERIAL DESCRIPTION	ELEVATION (feet-MSL)	SAMPLE NO.	SAMPLE TYPE	BLOW COUNT / CORE DATA 1st 6in / RUN #	2nd 6in / REC	3rd 6in / RQD	4th 6in	N VALUE
	Approximately 1 inch of asphalt								
	Approximately 2 inches of stone base								
	CLAYEY SAND (SC) mostly fine to medium sand, some medium to high plasticity fines, medium dense, moist, red with brown and light gray [TERTIARY TERRACE].		1		6	10	12		22
5		247.0	2		8	12	14		26
			3		6	8	13		21
10	- - - Some low to medium plasticity fines, with angular quartz fragments (1" maximum), light brownish red.	242.0	4		5	6	6		12
15	- - - Little low plasticity fines, with fine quartz fragments, loose, tannish orange with white.	237.0	5		4	4	4		8
20		232.0	6		3	4	3		7
25	**CLAYEY SAND with GRAVEL (SC)** mostly fine to coarse sand, little low to medium plasticity fines, few angular quartz fragments (2" maximum dimension) in sample, medium dense, moist to wet, tan.	227.0	7		16	12	8		20
30	**SANDY LEAN CLAY (CL)** mostly medium plasticity kaolinitic fines, some fine to medium sand, micaceous, moist, hard, light gray [CRETACEOUS SANDS & CLAYS].	222.0	8		12	17	21		38
35		217.0	9		11	15	18		33
40	**CLAYEY SAND (SC)** mostly medium to coarse sand, little medium plasticity kaolinitic fines, micaceous, medium dense, wet, light gray with light brown.	212.0	10		10	14	16		30
45	- - - Fine to medium sand, moist to wet.	207.0	11		9	7	7		14

WATER LEVEL: ▽



S&ME BORING LOG - VOGTLE DMSB BORING LOGS.GPJ S&ME 2009_09_24.GDT 12/10/10

NOTES:

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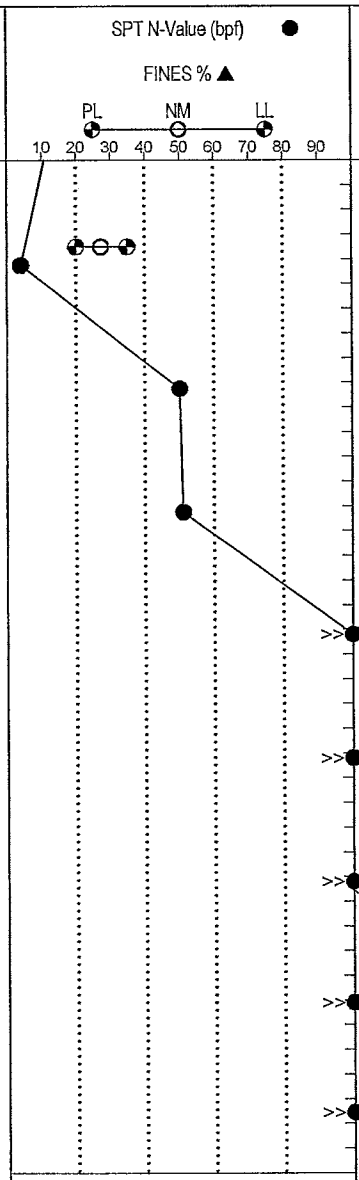
3. *STRATIFICATION AND GROUNDWATER DEPTHS ARE NOT EXACT.*
4. *WATER LEVEL IS AT TIME OF EXPLORATION AND WILL VARY.*

S&ME

PROJECT:	Darla Moore School of Business Columbia, SC S&ME Project No. 1611-10-426	BORING LOG: B-4
DATE DRILLED: 11/9/10	ELEVATION: 252.0 ft	NOTES: Elevations estimated from provided site topographic plan. No survey of boring locations or elevations conducted by S&ME.
DRILL RIG: CME 45-B	BORING DEPTH: 91.0 ft	
DRILLER: Wessinger	WATER LEVEL: 42 ft. @ TOB	
HAMMER TYPE: Safety	LOGGED BY: M. Glunt	
SAMPLING METHOD: Split spoon		NORTHING: / EASTING:
DRILLING METHOD: 2¼" H.S.A.		

DEPTH (feet)	MATERIAL DESCRIPTION	ELEVATION (feet-MSL)	SAMPLE NO.	SAMPLE TYPE	BLOW COUNT / CORE DATA 1st 6in / RUN #	2nd 6in / REC	3rd 6in / RQD	4th 6in	N VALUE
	[CRETACEOUS SANDS & CLAYS]								
55	**SANDY LEAN CLAY (CL)** mostly medium plasticity fines, some fine to coarse sand, micaceous, soft, wet, white with light brown.	197.0	13		2	2	2		4
60	**POORLY-GRADED SAND with CLAY (SP/SC)** mostly fine to medium sand, few low plasticity fines, micaceous, dense, wet, white with light brown.	192.0	14		10	15	35		50
65	**SANDY SILT (ML)** mostly low to medium plasticity fines, some fine to coarse sand, micaceous, very hard, moist, white with orange [PIEDMONT RESIDUUM].	187.0	15		13	18	33		51
70	**PARTIALLY WEATHERED ROCK sampled as SANDY SILT (ML)** mostly low to medium plasticity fines, some fine to coarse sand, micaceous, very hard, moist, white with orange and yellow.	182.0	16		15	25	50/5"		>>50/5"
75	- - - Increased sand content.	177.0	17		16	30	50/5"		>>50/5"
80	**PARTIALLY WEATHERED ROCK sampled as SILTY SAND (SM)** mostly fine to coarse sand, some low plasticity fines, micaceous, very dense, moist, white with orange and yellow.	172.0	18		15	34	50/4.5"		>>50/4.5"
85	- - - Gray with dark gray banding.	167.0	19		19	42	50/2"		>>50/2"
90	- - - No recovery.	162.0	20		50/0"				>>50/0"
	- - - Auger Refusal at 91.0 feet. Boring terminated at 91 feet								



S&ME BORING LOG - VOGTLE DMSB BORING LOGS.GPJ S&ME 2009_09_24.GDT 12/10/10

NOTES:

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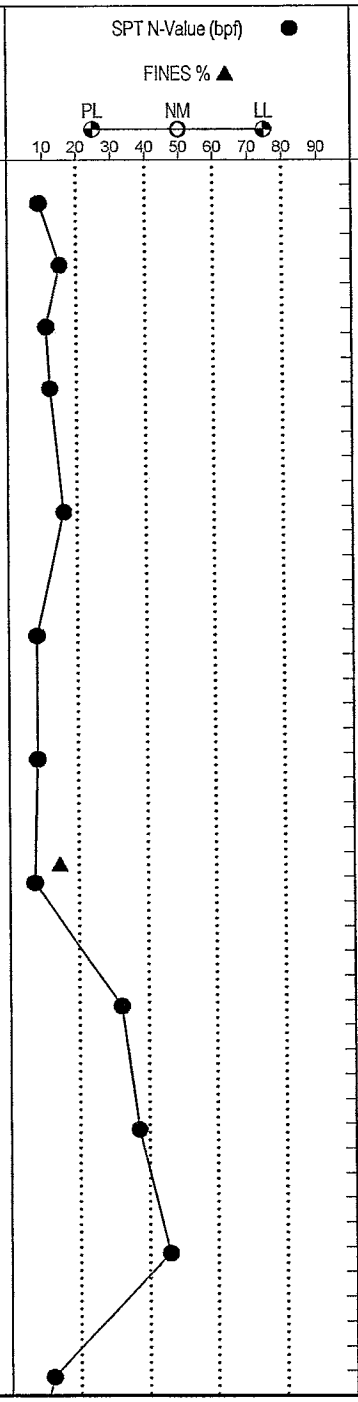
4. *WATER LEVEL IS AT TIME OF EXPLORATION AND WILL VARY.*

S&ME

PROJECT:	Darla Moore School of Business Columbia, SC S&ME Project No. 1611-10-426	BORING LOG: B-4
DATE DRILLED: 11/9/10	ELEVATION: 252.0 ft	NOTES: Elevations estimated from provided site topographic plan. No survey of boring locations or elevations conducted by S&ME.
DRILL RIG: CME 45-B	BORING DEPTH: 91.0 ft	
DRILLER: Wessinger	WATER LEVEL: 42 ft. @ TOB	
HAMMER TYPE: Safety	LOGGED BY: M. Glunt	
SAMPLING METHOD: Split spoon		NORTHING: EASTING:
DRILLING METHOD: 2¼" H.S.A.		

DEPTH (feet)	MATERIAL DESCRIPTION	ELEVATION (feet-MSL)	SAMPLE NO.	SAMPLE TYPE	BLOW COUNT / CORE DATA 1st 6in / RUN #	2nd 6in / REC	3rd 6in / RQD	4th 6in	N VALUE
	Approximately 6 inches of topsoil.								
	CLAYEY SAND (SC) mostly fine to medium sand, some low to medium plasticity fines, loose, dry to moist, dark red with white [TERTIARY TERRACE].		1		4	4	5		9
5	--- Little low plasticity fines, medium dense, light brownish red with white.	247.0	2		6	8	7		15
			3		7	6	5		11
10	--- With fine angular quartz fragments.	242.0	4		5	6	6		12
15	**CLAYEY SAND with GRAVEL (SC)** mostly fine to coarse sand, little low plasticity fines, few angular quartz fragments (1.5" maximum), medium dense, moist, tan with white.	237.0	5		8	9	7		16
20	**CLAYEY SAND (SC)** mostly fine to medium sand, little low plasticity fines, loose, moist, orange.	232.0	6		4	4	4		8
25	--- Fine to coarse sand, tan.	227.0	7		4	4	4		8
30	--- Tannish orange.	222.0	8		4	4	3		7
35	**SANDY LEAN CLAY (CL)** mostly medium plasticity fines, some fine to coarse sand, micaceous, hard, moist, gray with orange [CRETACEOUS SANDS & CLAYS].	217.0	9		12	15	17		32
40		212.0	10		11	15	22		37
45	**LEAN CLAY with SAND (CL)** mostly medium plasticity fines, little fine to medium sand, micaceous, hard, moist, light gray with orange.	207.0	11		12	17	29		46
	--- With red mottles.		12		3	5	7		12



S&ME BORING LOG - VOGTLE DMSB BORING LOGS.GPJ S&ME 2009_09_24.GDT 12/10/10

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

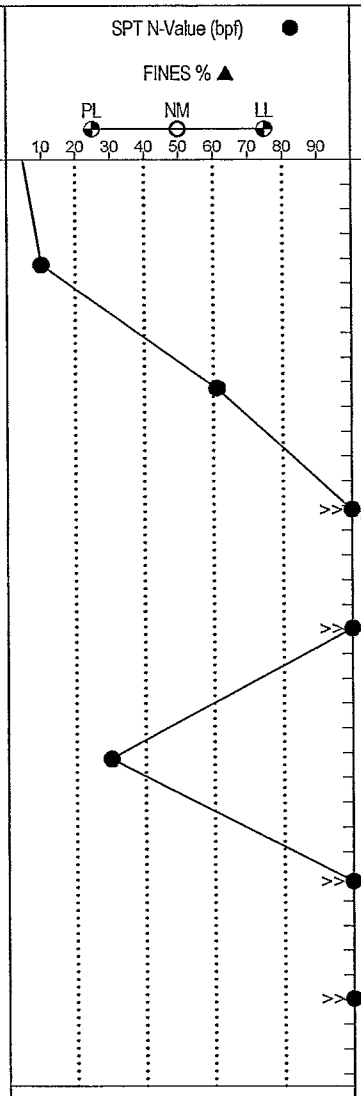
S&ME

PROJECT: Darla Moore School of Business Columbia, SC S&ME Project No. 1611-10-426	BORING LOG: B-3

DATE DRILLED: 11/10/10	ELEVATION: 251.0 ft	NOTES: Elevations estimated from provided site topographic plan. No survey of boring locations or elevations conducted by S&ME.
DRILL RIG: CME 45-B	BORING DEPTH: 87.5 ft	
DRILLER: Wessinger	WATER LEVEL: 38.8 ft. @ TOB	
HAMMER TYPE: Safety	LOGGED BY: M. Glunt	
SAMPLING METHOD: Split spoon		NORTHING: / EASTING:
DRILLING METHOD: 2¼" H.S.A.		

DEPTH (feet)	MATERIAL DESCRIPTION	ELEVATION (feet-MSL)	SAMPLE NO.	SAMPLE TYPE	BLOW COUNT / CORE DATA 1st 6in / RUN #	2nd 6in / REC	3rd 6in / RQD	4th 6in	N VALUE
	[CRETACEOUS SANDS & CLAYS]								
55	**SANDY LEAN CLAY (CL)** mostly medium plasticity fines, some fine to medium sand (interbedded seams), stiff, wet, light gray with brownish red.	196.0	13		4	5	5		10
60	**SANDY SILT (ML)** mostly low to medium plasticity fines, some fine to coarse sand, micaceous, very hard, moist, white with orange [PIEDMONT RESIDUUM].	191.0	14		15	22	39		61
65	**PARTIALLY WEATHERED ROCK sampled as SANDY SILT (ML)** mostly low plasticity fines, some fine to coarse sand, micaceous, very hard, moist, white with gray and orange.	186.0	15		24	37	50/4"		>>50/4"
70		181.0	16		32	50/5"			>>50/5"
75	**SILT (ML)** mostly medium plasticity fines, few fine sands, very stiff, moist, dark red.	176.0	17		12	14	16		30
80	**PARTIALLY WEATHERED ROCK sampled as SILT (ML)** mostly medium plasticity fines, few fine sands, very hard, moist, dark red.	171.0	18		13	29	50/5"		>>50/5"
85	**PARTIALLY WEATHERED ROCK sampled as SILTY SAND (SM)** mostly fine to coarse sand, some low plasticity fines, micaceous, very hard, moist, white with yellow.	166.0	19		29	50/5"			>>50/5"
	- - - Auger Refusal at 87.5 feet. Boring terminated at 87.5 feet								

WATER LEVEL



S&ME BORING LOG - VOGTLE DMSB BORING LOGS.GPJ S&ME 2009 09_24.GDT 12/10/10

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S&ME

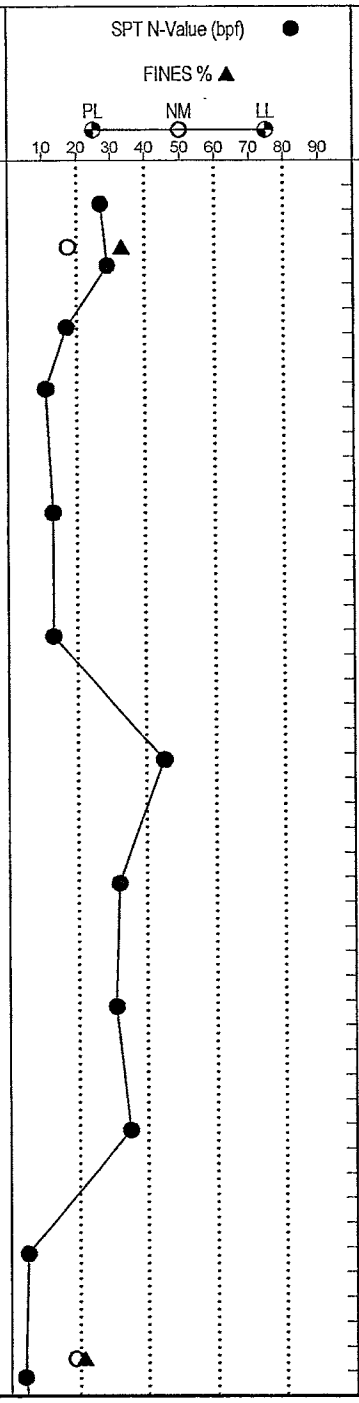
PROJECT:	Darla Moore School of Business Columbia, SC S&ME Project No. 1611-10-426	BORING LOG: B-3
DATE DRILLED: 11/10/10	ELEVATION: 251.0 ft	NOTES: Elevations estimated from provided site topographic plan. No survey of boring locations or elevations conducted by S&ME.
DRILL RIG: CME 45-B	BORING DEPTH: 87.5 ft	
DRILLER: Wessinger	WATER LEVEL: 38.8 ft. @ TOB	
HAMMER TYPE: Safety	LOGGED BY: M. Glunt	
SAMPLING METHOD: Split spoon		NORTHING: / EASTING:
DRILLING METHOD: 2¼" H.S.A.		

DEPTH (feet)	MATERIAL DESCRIPTION	ELEVATION (feet-MSL)	SAMPLE NO.	1st 6in / RUN #	2nd 6in / REC	3rd 6in / RQD	4th 6in	N VALUE
	Approximately 3 inches of asphalt.							
	Approximately 3 inches of stone base.							
5	**CLAYEY SAND (SC)** mostly fine to medium sand, some medium plasticity fines, medium dense, moist, red with brown [TERTIARY TERRACE].	246.0	1	8	12	15		27
	--- With light gray.		2	8	13	16		29
10	--- Some low plasticity fines, with angular quartz fragments, light brownish red with white.	241.0	3	7	8	9		17
			4	5	6	5		11
15	--- Absent quartz fragments.	236.0	5	6	6	7		13
20		231.0	6	5	6	7		13
25	--- With rounded gravel in sample, moist to wet, dense.	226.0	7	10	15	30		45
30	**SANDY LEAN CLAY (CL)** mostly medium plasticity fines, some fine to medium sand, micaceous, hard, moist, light gray with orange [CRETACEOUS SANDS & CLAYS].	221.0	8	17	14	18		32
35		216.0	9	14	14	17		31
40	**CLAYEY SAND (SC)** mostly fine to coarse sand, some medium plasticity fines, micaceous, dense, wet, light gray.	211.0	10	11	16	19		35
45	--- Loose, with yellow.	206.0	11	2	2	3		5
	--- Little low to medium plasticity fines, very loose.		12	3	2	2		4

WATER LEVEL: ▽

SAMPLE TYPE: ⧗

BLOW COUNT / CORE DATA



S&ME BORING LOG - VOGTLE DMSB BORING LOGS.GPJ S&ME 2009_09_24.GDT 12/10/10

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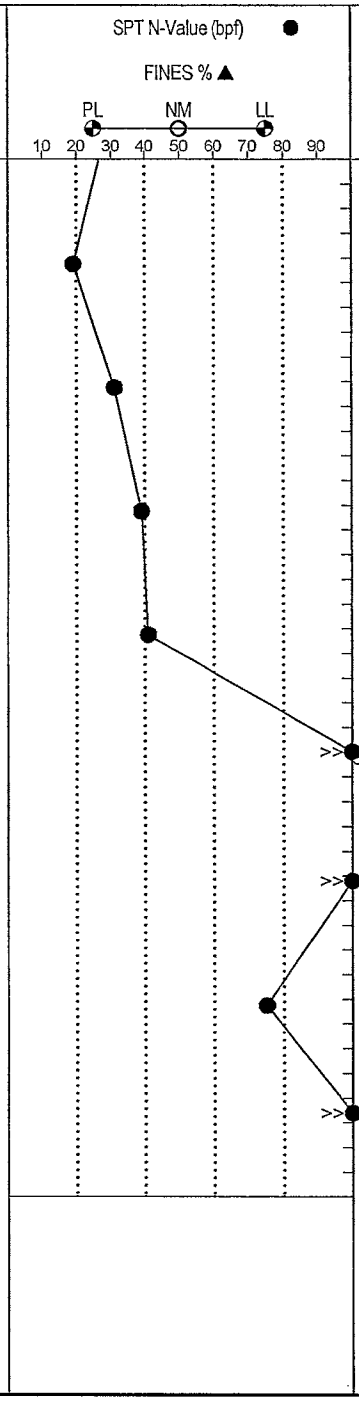
S&ME

PROJECT: Darla Moore School of Business Columbia, SC S&ME Project No. 1611-10-426	BORING LOG: B-2

DATE DRILLED: 11/10/10	ELEVATION: 251.0 ft	NOTES: Elevations estimated from provided site topographic plan. No survey of boring locations or elevations conducted by S&ME.
DRILL RIG: CME 45-B	BORING DEPTH: 92.0 ft	
DRILLER: Wessinger	WATER LEVEL: 41 ft. @ TOB	
HAMMER TYPE: Safety	LOGGED BY: M. Glunt	
SAMPLING METHOD: Split spoon		NORTHING: / EASTING:
DRILLING METHOD: 2¼" H.S.A.		

DEPTH (feet)	GRAPHIC LOG	MATERIAL DESCRIPTION	WATER LEVEL	ELEVATION (feet-MSL)	SAMPLE NO.	SAMPLE TYPE	BLOW COUNT / CORE DATA 1st 6in / RUN #	2nd 6in / REC	3rd 6in / RQD	4th 6in	N VALUE
		[CRETACEOUS SANDS & CLAYS]									
55		- - - Mostly fine to medium sand, some medium plasticity fines (interbedded kaolin seams), red with brown and white.		196.0	13		9	7	12		19
60		- - - With 2" quartzite fragment in sample, dense, wet.		191.0	14		11	13	18		31
65		**SANDY SILT (ML)** mostly low plasticity fines, some fine to medium sand, micaceous, hard, moist, light gray with orange [PIEDMONT RESIDUUM].		186.0	15		14	17	22		39
70				181.0	16		17	18	23		41
75		**PARTIALLY WEATHERED ROCK (PWR) sampled as SANDY SILT (ML)** mostly low plasticity fines, some fine to medium sand, with angular quartz fragments, micaceous, very hard, moist, light gray with orange.		176.0	17		29	50/5.5"			>>50/5.5"
80		**PWR sampled as SILTY SAND (SM)** mostly fine to coarse sand, some low plasticity fines, with fine angular quartz fragments, micaceous, very dense, moist, white with yellow and orange.		171.0	18		20	19	50/5"		>>50/5"
85		**SILTY SAND (SM)** mostly fine to coarse sand, some low plasticity fines, with fine angular quartz fragments, micaceous, very dense, moist, white with yellow and orange.		166.0	19		17	27	48		75
90		**PWR sampled as SILTY SAND (SM)** mostly fine to coarse sand, some low plasticity fines, with fine angular quartz fragments, micaceous, very dense, moist, white with yellow and orange.		161.0	20		50/2"				>>50/2"
		- - - Auger Refusal at 92.0 feet. Boring terminated at 92 feet									



S&ME BORING LOG - VOGTLE DMSB BORING LOGS.GPJ S&ME 2009_09_24.GDT 12/10/10

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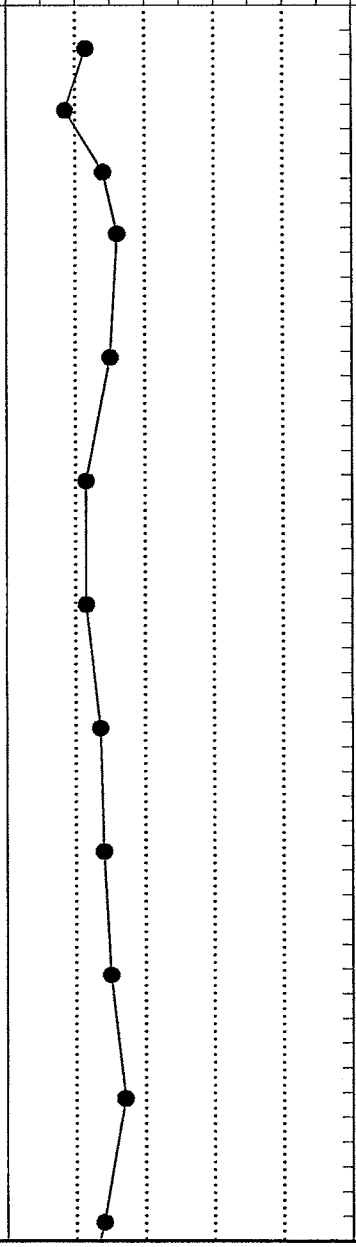
S&ME

PROJECT:	Darla Moore School of Business Columbia, SC S&ME Project No. 1611-10-426	BORING LOG: B-2

DATE DRILLED: 11/10/10	ELEVATION: 251.0 ft	NOTES: Elevations estimated from provided site topographic plan. No survey of boring locations or elevations conducted by S&ME.
DRILL RIG: CME 45-B	BORING DEPTH: 92.0 ft	
DRILLER: Wessinger	WATER LEVEL: 41 ft. @ TOB	
HAMMER TYPE: Safety	LOGGED BY: M. Glunt	
SAMPLING METHOD: Split spoon		NORTHING: / EASTING:
DRILLING METHOD: 2¼" H.S.A.		

DEPTH (feet)	GRAPHIC LOG	MATERIAL DESCRIPTION	WATER LEVEL	ELEVATION (feet-MSL)	SAMPLE NO.	SAMPLE TYPE	BLOW COUNT / CORE DATA 1st 6in / RUN #	2nd 6in / REC	3rd 6in / RQD	4th 6in	N VALUE
		Approximately 3 inches of asphalt.									
		Approximately 6 inches of stone base.			1		8	11	12		23
5		**CLAYEY SAND (SC)** mostly fine to coarse sand, some low to medium plasticity fines, with angular quartz fragments, medium dense, dry to moist, light reddish brown [FILL].		246.0	2		6	8	9		17
					3		9	12	16		28
10		- - - Brown with red.		241.0	4		14	15	17		32
		POORLY-GRADED SAND (SP) mostly fine sand, trace non-plastic fines, dense, dry, light brown [FILL].									
15		**CLAYEY SAND (SC)** mostly fine to coarse sand, some low to medium plasticity fines, with fine angular quartz fragments, medium dense, dry to moist, light brownish red with white [TERTIARY TERRACE].		236.0	5		12	14	16		30
20				231.0	6		8	10	13		23
25		**SANDY LEAN CLAY (CL)** mostly medium plasticity fines, some fine to coarse sand, very stiff, moist, orange with light gray.		226.0	7		6	11	12		23
30		**CLAYEY SAND (SC)** mostly fine to coarse sand, some low to medium plasticity fines, medium dense, moist, brownish red with light brown.		221.0	8		9	13	14		27
35		**SANDY LEAN CLAY (CL)** mostly medium plasticity fines, some fine to coarse sand, micaceous, very stiff, moist, light gray with orange [CRETACEOUS SANDS & CLAYS].		216.0	9		11	13	15		28
40		**CLAYEY SAND (SC)** mostly fine to coarse sand, some medium plasticity fines, micaceous, medium dense, moist, light gray with orange.	▽	211.0	10		13	14	16		30
45		- - - Mostly fine sand, little low plasticity fines, dense, moist to wet.		206.0	11		12	16	18		34
		- - - Medium dense.			12		10	14	14		28



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S&ME

PROJECT:	Darla Moore School of Business Columbia, SC S&ME Project No. 1611-10-426	BORING LOG: B-1
DATE DRILLED: 11/12/10	ELEVATION: 227.0 ft	NOTES: Elevations estimated from provided site topographic plan. No survey of boring locations or elevations conducted by S&ME.
DRILL RIG: CME 45-B	BORING DEPTH: 73.0 ft	
DRILLER: Wessinger	WATER LEVEL: 19.1 ft. @ TOB	
HAMMER TYPE: Safety	LOGGED BY: M. Glunt	
SAMPLING METHOD: Split spoon		NORTHING: EASTING:
DRILLING METHOD: 2¼" H.S.A.		

DEPTH (feet)	GRAPHIC LOG	MATERIAL DESCRIPTION	WATER LEVEL	ELEVATION (feet-MSL)	SAMPLE NO.	SAMPLE TYPE	BLOW COUNT / CORE DATA 1st 6in / RUN #	2nd 6in / REC	3rd 6in / RQD	4th 6in	SPT N-Value (bpf) ● / FINES % ▲ (PL, NM, LL; 10 20 30 40 50 60 70 80 90)	N VALUE
		[PIEDMONT RESIDUUM]										
45		- - - Very hard, orange with yellow and white.		182.0	11		16	23	46			69
50				177.0	12		19	31	45			76
55		- - - Mostly low plasticity fines, hard, dark gray with yellow speckled.		172.0	13		12	13	20			33
60				167.0	14		14	16	19			35
65		**PARTIALLY WEATHERED ROCK sampled as SILTY SAND (SM)** mostly fine to coarse sand, some low plasticity fines, with fine angular rock fragments, micaceous, very dense, moist, dark gray with yellow and orange.		162.0	15		35	50/5"			>>	50/5"
70		- - - No recovery.		157.0	16		50/1"				>>	50/1"
		- - - Auger Refusal at 73.0 feet. Boring terminated at 73 feet										

S&ME BORING LOG - VOGTLE DMSB BORING LOGS.GPJ S&ME 2009_09_24.GDT 12/10/10

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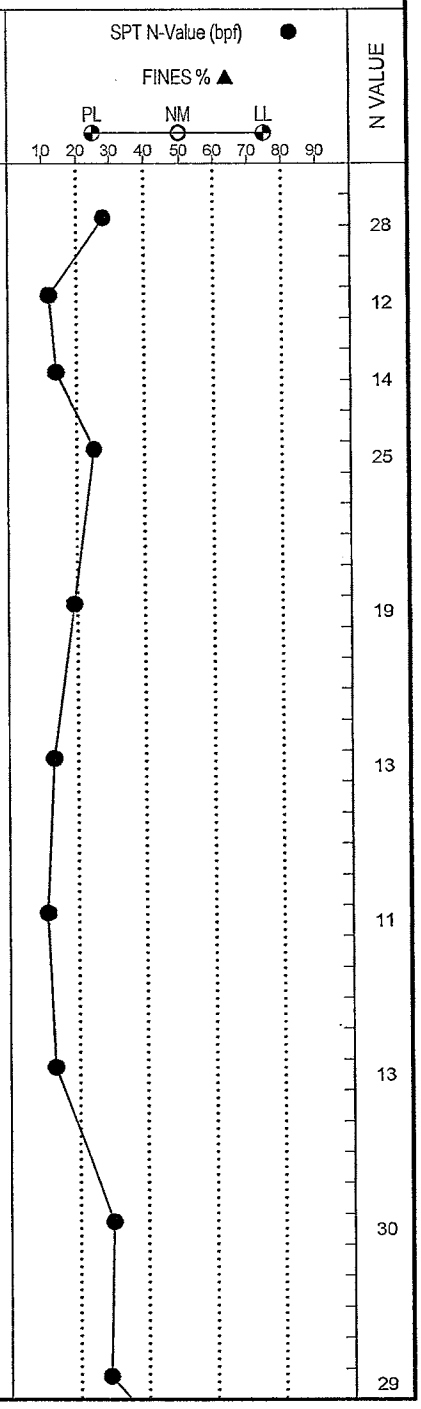
S&ME

PROJECT:	Darla Moore School of Business Columbia, SC S&ME Project No. 1611-10-426	BORING LOG: B-1
DATE DRILLED: 11/12/10	ELEVATION: 227.0 ft	NOTES: Elevations estimated from provided site topographic plan. No survey of boring locations or elevations conducted by S&ME.
DRILL RIG: CME 45-B	BORING DEPTH: 73.0 ft	
DRILLER: Wessinger	WATER LEVEL: 19.1 ft. @ TOB	
HAMMER TYPE: Safety	LOGGED BY: M. Glunt	
SAMPLING METHOD: Split spoon		NORTHING: EASTING:
DRILLING METHOD: 2¼" H.S.A.		

DEPTH (feet)	MATERIAL DESCRIPTION	ELEVATION (feet-MSL)	SAMPLE NO.	SAMPLE TYPE	BLOW COUNT / CORE DATA 1st 6in / RUN #	2nd 6in / REC	3rd 6in / RQD	4th 6in	N VALUE
	Approximately 4 inches of concrete.								
	POORLY-GRADED SAND with CLAY (SP/SC) mostly fine sand, few non-plastic fines, medium dense, dry, light brown [FILL].		1		10	13	15		28
5	**CLAYEY SAND (SC)** mostly fine sand, little low plasticity fines, medium dense, dry to moist, reddish brown [TERTIARY TERRACE].	222.0	2		4	6	6		12
			3		6	7	7		14
10	**SANDY LEAN CLAY (CL)** mostly medium plasticity fines, some fine to medium sand, very stiff, moist, gray with red and brown.	217.0	4		9	11	14		25
15	- - - With rounded quartz gravel (3/4" maximum), light gray.	212.0	5		9	9	10		19
20	**CLAYEY SAND (SC)** mostly fine to coarse sand, some medium plasticity fines (interbedded kaolin seams), medium dense, wet, orange with light red and white [CRETACEOUS SANDS & CLAYS].	207.0	6		9	6	7		13
25		202.0	7		3	4	7		11
30	- - - Mostly fine to medium sand.	197.0	8		4	5	8		13
35	**SANDY SILT (ML)** mostly low to medium plasticity fines, some fine to coarse sand, miaceous, very stiff, moist, white with red and brown [PIEDMONT RESIDUUM].	192.0	9		11	13	17		30
			10		12	13	16		29



WATER LEVEL ▽

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S&ME

LEGEND TO SOIL CLASSIFICATION AND SYMBOLS

SOIL TYPES

(Shown in Graphic Log)

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

WATER LEVELS

(Shown in Water Level Column)

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

CONSISTENCY OF COHESIVE SOILS

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

RELATIVE DENSITY OF COHESIONLESS SOILS

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

SAMPLER TYPES

(Shown in Samples Column)

- Shelby Tube
- Split Spoon
- Rock Core
- No Recovery

TERMS

Standard Penetration Resistance - The Number of Blows of 140 lb. Hammer Falling 30 in. Required to Drive 1.4 in. I.D. Split Spoon Sampler 1 Foot. As Specified in ASTM D-1586.

REC - Total Length of Rock Recovered in the Core Barrel Divided by the Total Length of the Core Run Times 100%.

RQD - Total Length of Sound Rock Segments Recovered that are Longer Than or Equal to 4" (mechanical breaks excluded) Divided by the Total Length of the Core Run Times 100%.

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ENVIRONMENTAL SERVICES

Double Tube, Pitcher Type Sampling - Samples of highly compacted, hard, stiff uncemented or slightly cemented materials are obtained using a double tube soil core barrel with liner. The double-tube core barrel is advanced by rotating the outer barrel, which cuts a circular groove and loosens the soil material to be displaced by the two barrels. Drilling fluid was forced downward through the drill stem. The inner barrel, which does not rotate, moves downward over the relatively undisturbed core of soil formed by rotation of the outer barrel. A liner is inserted into the inner barrel before the sampler was assembled. After drilling the required length, the sampler is withdrawn and the liner removed, made airtight, and transported to the laboratory.

Borehole Closure – Following collection of relevant geotechnical data, boreholes were backfilled by pouring drilling cuttings into the open hole. The upper two feet of backfill was tamped as heavily as possible with a shovel handle.

Patching of Asphalt Surface – Penetrations of asphalt surfaces made during the drilling process were patched using compacted asphalt cold patch material. Cold patch asphalt was placed to provide a surface flush with existing pavement adjacent to the boring. Cold patch asphalt was compacted by tamping it into the boring with a shovel handle or similar hand held equipment.

SUMMARY OF FIELD PROCEDURES

CONFIGURATION AND LAYOUT OF BORINGS

Layout Plan – S&ME was provided with a planned building footprint prior to drilling. Boring locations were laid out on site in accessible areas using the provided plan and measuring from existing site features.

Checks for Hazardous Conditions - After receiving notice to proceed, we notified the Palmetto Utility Protection Service (PUPS) of our intent to drill at the site. S&ME checked proposed sampling points for conflicts with marked utilities, overhead power lines, tree limbs, or man-made structures during reconnaissance of the site.

Staking of Borings - Boring locations were marked in the field with orange pin flags orange marking paint indicating the boring number. Boring locations indicated on the attached Boring Location Plan must be considered approximate.

Boring Elevations - Top-of-ground elevations at borings were interpolated from a site topographic survey provided to S&ME during the performance of our exploration. Boring elevations shown on the borings logs and subsurface profiles must be considered approximate.

BORING AND SAMPLING PROCEDURES

Field Boring Logs - The subsurface conditions encountered during drilling were reported on a field test boring log by the chief driller. The record contains information about the drilling method used, samples attempted and recovered, materials encountered in the borings, and materials encountered between sample intervals. Field boring records are retained at our office.

Soil Test Borings by Hollow Stem Auger - Soil sampling and penetration testing were performed in general accordance with ASTM D1586, "Standard Test Method for Penetration Test and Split Barrel Sampling of Soils". Borings were made by mechanically twisting a continuous steel hollow stem auger into the soil. At regular intervals, soil samples were obtained with a standard 1.4 inch I. D., two-inch O. D., split barrel sampler. The sampler was first seated six inches to penetrate any loose cuttings, then driven an additional 12 inches with blows of a 140-pound hammer falling 30 inches. The number of hammer blows required to drive the sampler through the two final six-inch increments was recorded as the penetration resistance (SPT N) value. The N-value, when properly interpreted by qualified professional staff, is an index of the soil strength and foundation support capability.

Ground Water Measurements - Water level readings were made in the open boreholes immediately after completing drilling and withdrawal of the tools. Procedures for groundwater measurement in open boreholes generally followed those described in ASTM D 4750 using the weighted tape method.

Installation of Temporary PVC Casing (Observation Well) - In two of the borings, a temporary observation well was constructed by inserting 2" PVC casing to a depth below the ground water table. A slotted PVC well screen was attached to the bottom of the PVC pipe to allow subsurface water to enter the well. Fine sand was placed in the borehole annulus over the screened depth and a bentonite seal was installed above the sand pack. A flush mount monitoring well cap was installed on one of the observation wells.

APPENDIX B

Darla Moore School of Business
S&ME Project No. 1611-10-426
Load-Settlement Summary by *Settle3D*
6/16/2011

S&ME

Loc.	Column ID	Est. Load (kips) (DL + LL)	Allowable Bearing Pressure (psf)	Footing Size (ft.)	Bottom of Footing Elevation (est.)	Immediate Settlement (in.)[1,2]	Total Settlement (in.)[1,2]
Northwest	Core	4300	5000	30 x 30	224	0.90	0.98
		4300	4000	33 x 33	224	0.59	0.61
		4300	3000	38 x 38	224	0.23	0.25
	E4	265	3000	10 x 10	234	0.71	0.71
		265	5000	8 x 8	228	1.22	1.24
	D5	600	5000	11 x 11	228	0.37	0.40
Northeast	Core	4300	5000	30 x 30	224	0.14	0.40
		4300	4000	33 x 33	224	0.08	0.26
	R4	400	5000	9 x 9	228	0 (net)	0 (net)
	S4	330	3000	11 x 11	248	1.14	1.15
	N4	265	3000	10 x 10	234	0.85	0.90
		265	3000	10 x 10	228	0.20	0.30
	P5	600	5000	11 x 11	228	0.10	0.10
	N5	230	3000	9 x 9	234	0.79	0.82
		230	3000	9 x 9	228	0.18	0.25
Southwest	Core	4300	5000	30 x 30	224	0.08	0.12
	E9	295	3000	10 x 10	234	0.58	0.61
		295	5000	8 x 8	228	0.50	0.61
Southeast	Core	4300	5000	30 x 30	224	0.07	0.24
	S10	370	3000	11 x 11	248	0.92	0.93
	R10	490	5000	10 x 10	228	0 (net)	0 (net)
Auditorium	L8	875	5000	13 x 13	228	0.30	0.35
	M8	220	3000	9 x 9	234	0.85	0.90
		220	5000	7 x 7	228	0.40	0.53
	G6	645	5000	12 x 12	228	0.20	0.25
	E6	180	5000	6 x 6	234	0.80	0.85
		180	3000	8 x 8	228	0.20	0.25

[1]Net settlement incorporating unloading (heave) effect of excavation
[2]At center of fully flexible footing (does not account for foundation rigidity)

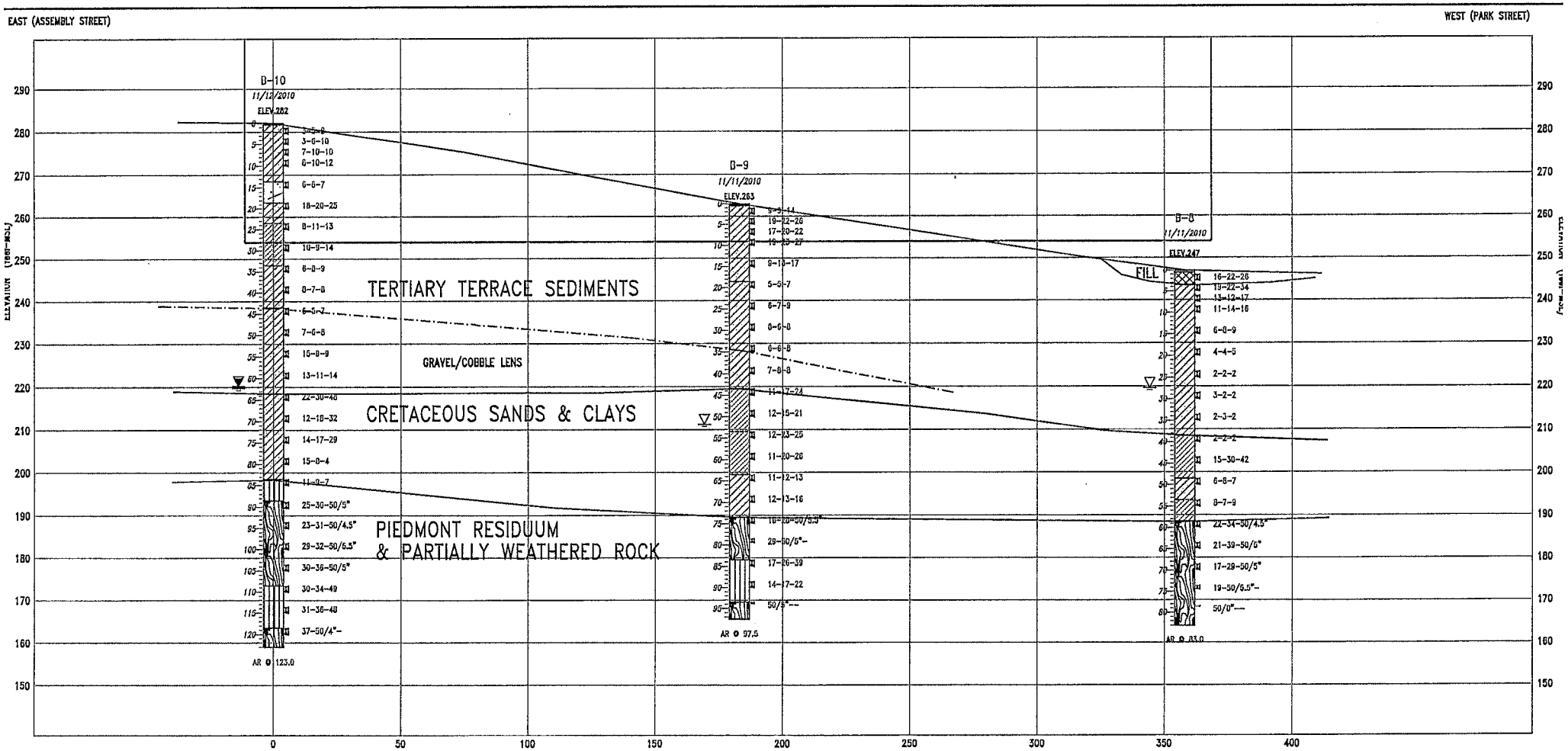


FIGURE 5

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 (E-W)

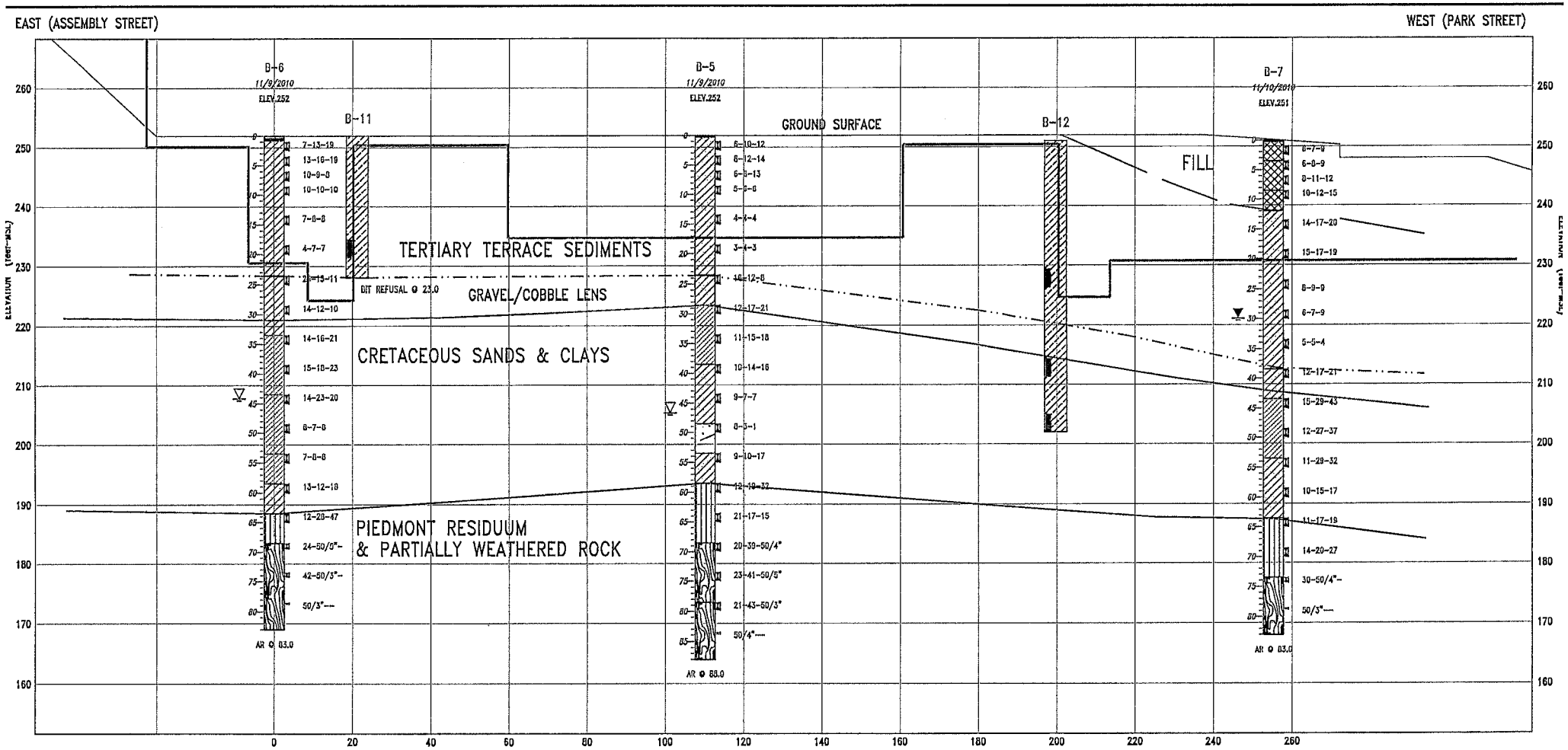
PROJECT: Darla Moore School of Business

LOCATION: Columbia, SC

JOB NO: 1611-10-426rev1

DATE: 10/12/11

S&ME ENGINEERING • TESTING ENVIRONMENTAL SERVICES



SOIL TEST BORINGS

B-3 Boring Number
123.0 Elevation at GS

Water Level at Time of Boring
Water Level after 24 Hours
Hole Caved
Water Loss/Inflow

11-18-10 Standard Penetration Test (blows per foot).
12in Undisturbed Sample Recovery in Inches
HX Core Barrel Size
REC 80% Recovery in Percent
RQD 56% Rock Quality Designation
BT Boring Termination Depth
AR Boring Refusal

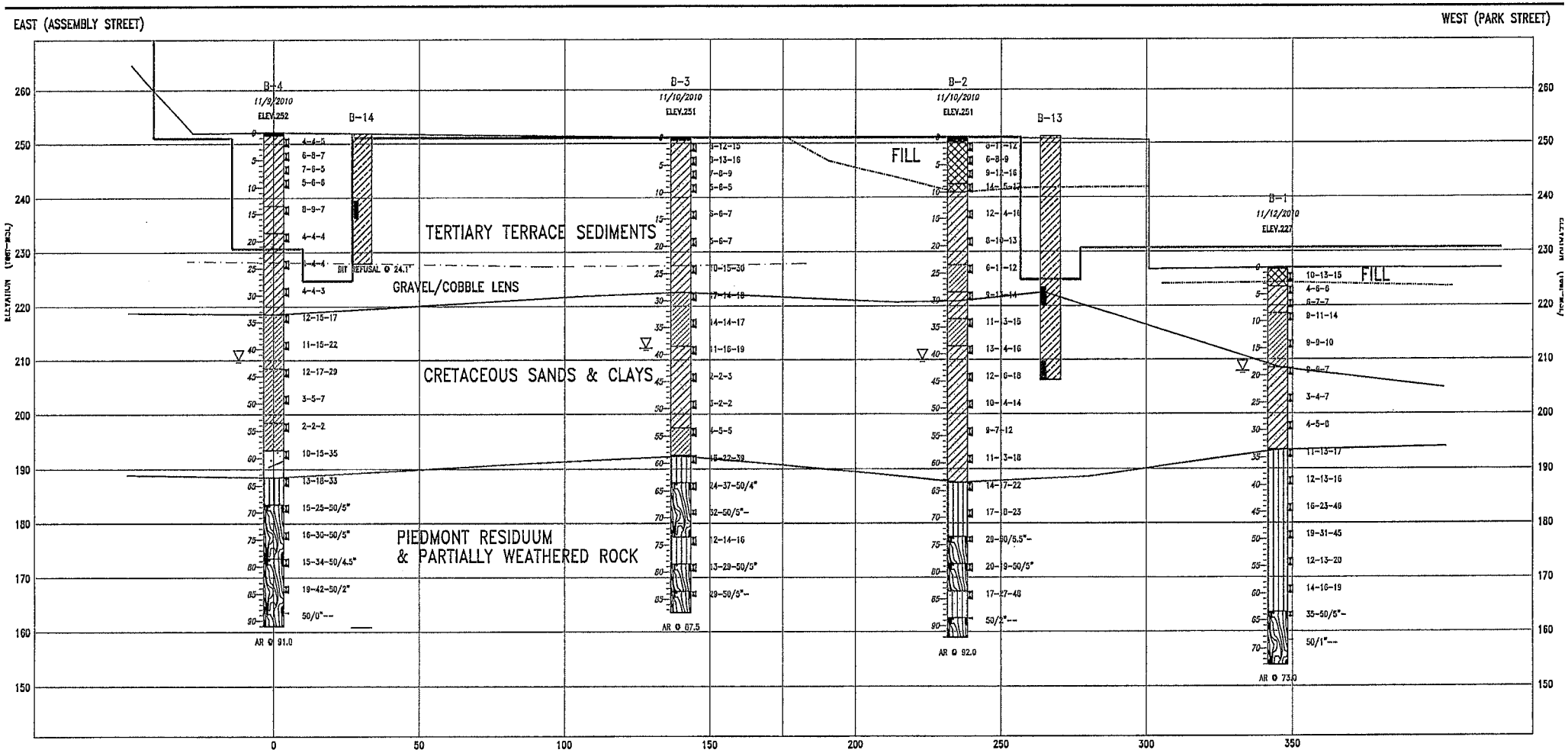
LEGEND OF MATERIAL GRAPHICS for SOIL TEST BORINGS

- Asphalt
- CH, High Plasticity Clay
- Topsoil
- Aggregate Base Course
- SP/SC, Poorly-graded Sand with Clay
- Fill
- CL, Low Plasticity Clay
- ML, Low Plasticity Silt
- SC, Clayey Sand
- Partially Weathered Rock

FIGURE 4

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 (E-W)	JOB NO: 1611-10-426rev1	S&ME ENGINEERING • TESTING ENVIRONMENTAL SERVICES
PROJECT: Darla Moore School of Business		
LOCATION: Columbia, SC	DATE: 10/12/11	



SOIL TEST BORINGS

B-3 Boring Number
123.0 Elevation of GS

Water Level at Time of Boring
Water Level after 24 Hours
Hole Caved
Water Loss/Inflow

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

LEGEND OF MATERIAL GRAPHICS for SOIL TEST BORINGS

- Concrete
- ML, Low Plasticity Silt
- Fill
- SP/SC, Poorly-graded Sand with Clay
- PWR
- SM, Silty Sand
- SC, Clayey Sand
- Asphalt
- Topsoil
- CL, Low Plasticity Clay
- Aggregate Base Course

FIGURE 3

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 (E-W)

PROJECT: Daria Moore School of Business

LOCATION: Columbia, SC

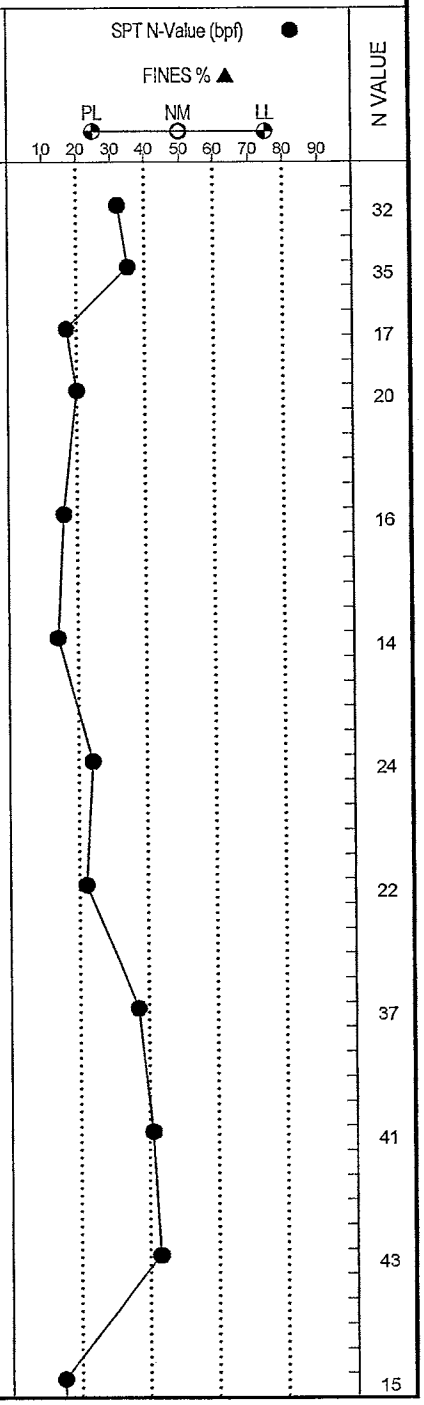
JOB NO: 1611-10-426rev1

DATE: 10/12/11

S&ME
ENGINEERING • TESTING
ENVIRONMENTAL SERVICES

PROJECT:	Darla Moore School of Business Columbia, SC S&ME Project No. 1611-10-426	BORING LOG: B-6
DATE DRILLED: 11/9/10	ELEVATION: 252.0 ft	NOTES: Elevations estimated from provided site topographic plan. No survey of boring locations or elevations conducted by S&ME.
DRILL RIG: CME 45-B	BORING DEPTH: 83.0 ft	
DRILLER: Wessinger	WATER LEVEL: 44.2 ft. @ TOB	
HAMMER TYPE: Safety	LOGGED BY: M. Glunt	
SAMPLING METHOD: Split spoon		NORTHING: / EASTING:
DRILLING METHOD: 2¼" H.S.A.		

DEPTH (feet)	MATERIAL DESCRIPTION	ELEVATION (feet-MSL)	SAMPLE NO.	SAMPLE TYPE	BLOW COUNT / CORE DATA 1st 6in / RUN #	2nd 6in / REC	3rd 6in / RQD	4th 6in	N VALUE
	Approximately 6 inches of asphalt								
	Approximately 4 inches of stone base								
5	**CLAYEY SAND (SC)** mostly fine to medium sand, some low to medium plasticity fines, dessicated, dense, dry to moist, light red with brown [TERTIARY TERRACE].	247.0	1		7	13	19		32
	- - - - medium dense.		2		13	16	19		35
10	- - - - with angular quartz fragments (1/2" maximum dimension), light red with white.	242.0	3		10	9	8		17
			4		10	10	10		20
15	- - - - little low to medium plasticity fines, tannish orange.	237.0	5		7	8	8		16
20		232.0	6		4	7	7		14
25	**CLAYEY SAND with GRAVEL (SC)** mostly fine sand, little low plasticity fines, few angular quartz fragments (2" maximum), medium dense, dry, tan.	227.0	7		26	13	11		24
30	- - - - mostly fine to coarse sand, dry to moist, light brownish red.	222.0	8		14	12	10		22
35	**SANDY LEAN CLAY (CL)** mostly medium plasticity kaolinitic fines, some fine to coarse sand, micaceous, hard, moist, light gray with yellow [CRETACEOUS SANDS & CLAYS].	217.0	9		14	16	21		37
40	- - - - some fine to medium sand.	212.0	10		15	18	23		41
45	**LEAN CLAY with SAND (CL)** mostly medium plasticity kaolinitic fines, little fine to medium sand, micaceous, hard, moist, light gray with yellow.	207.0	11		14	23	20		43
	- - - - stiff.		12		8	7	8		15



S&ME BORING LOG - VOGTLE DMSB BORING LOGS.GPJ S&ME 2009_09_24.GDT 12/10/10

NOTES:

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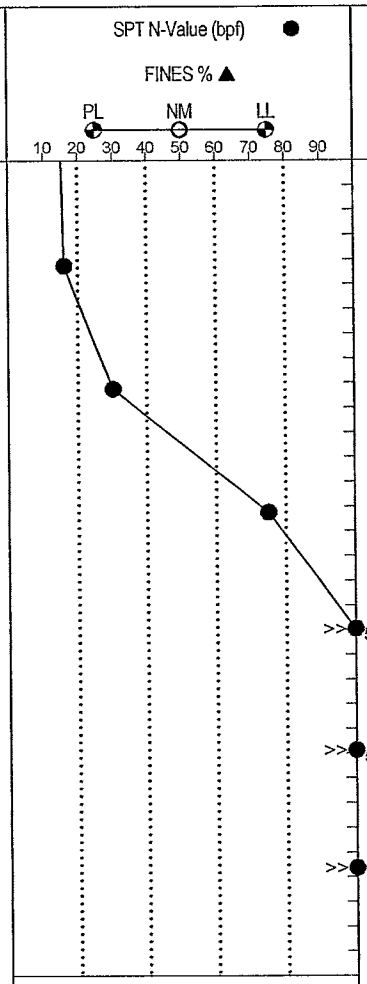
3. *STRATIFICATION AND GROUNDWATER DEPTHS ARE NOT EXACT.*
4. *WATER LEVEL IS AT TIME OF EXPLORATION AND WILL VARY.*

S&ME

PROJECT:	Darla Moore School of Business Columbia, SC S&ME Project No. 1611-10-426	BORING LOG: B-6
DATE DRILLED: 11/9/10	ELEVATION: 252.0 ft	NOTES: Elevations estimated from provided site topographic plan. No survey of boring locations or elevations conducted by S&ME.
DRILL RIG: CME 45-B	BORING DEPTH: 83.0 ft	
DRILLER: Wessinger	WATER LEVEL: 44.2 ft. @ TOB	
HAMMER TYPE: Safety	LOGGED BY: M. Glunt	
SAMPLING METHOD: Split spoon		NORTHING: EASTING:
DRILLING METHOD: 2¼" H.S.A.		

DEPTH (feet)	MATERIAL DESCRIPTION	ELEVATION (feet-MSL)	SAMPLE NO.	SAMPLE TYPE	BLOW COUNT / CORE DATA 1st 6in / RUN #	2nd 6in / REC	3rd 6in / RQD	4th 6in	N VALUE
	[CRETACEOUS SANDS & CLAYS]								
55	**SANDY LEAN CLAY (CL)** mostly medium plasticity fines, some fine to medium sands (interbedded seams), micaceous, very stiff, wet, light gray with light brownish red.	197.0	13		7	8	8		16
60	**CLAYEY SAND (SC)** mostly fine to medium sand, little low to medium plasticity fines, medium dense, wet, light brownish red.	192.0	14		13	12	18		30
65	**SANDY SILT (ML)** mostly low plasticity fines, some fine to coarse sand, micaceous, very hard, moist, white with orange [PIEDMONT RESIDUUM].	187.0	15		12	28	47		75
70	**PARTIALLY WEATHERED ROCK sampled as SANDY SILT (ML)** mostly low plasticity fines, some fine to coarse sand, micaceous, very hard, moist, white with orange.	182.0	16		24	50/5"			>> 50/5"
75	- - - - with fine angular quartz fragments.	177.0	17		42	50/3"			>> 50/3"
80	- - - Auger Refusal at 83.0 ft. Boring terminated at 83 feet	172.0	18		50/3"				>> 50/3"



S&ME BORING LOG - VOGTLE DMSB BORING LOGS.GPJ S&ME 2009 09 24.GDT 12/10/10

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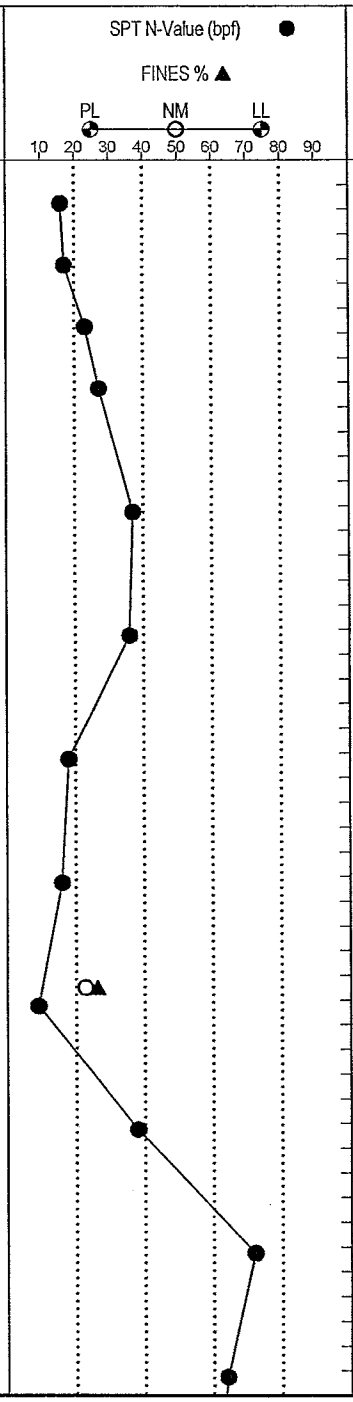
S&ME

PROJECT: Darla Moore School of Business Columbia, SC S&ME Project No. 1611-10-426	BORING LOG: B-7

DATE DRILLED: 11/10/10	ELEVATION: 252.0 ft	NOTES: Elevations estimated from provided site topographic plan. No survey of boring locations or elevations conducted by S&ME.
DRILL RIG: CME 45-B	BORING DEPTH: 83.0 ft	
DRILLER: Wessinger	WATER LEVEL: 29.9' 11/11/10, 29.9' 12/7/10	
HAMMER TYPE: Safety	LOGGED BY: M. Glunt	
SAMPLING METHOD: Split spoon		NORTHING: / EASTING:
DRILLING METHOD: 2¼" H.S.A.		

DEPTH (feet)	MATERIAL DESCRIPTION	ELEVATION (feet-MSL)	SAMPLE NO.	SAMPLE TYPE	1st 6in / RUN #	2nd 6in / REC	3rd 6in / RQD	4th 6in	N VALUE
	Approximately 3 inches of topsoil								
	SANDY LEAN CLAY (CL) mostly low to medium plasticity fines, some fine to medium sand, dessicated, very stiff, dry to moist, red with brown and gray [FILL].		1		6	7	9		16
5		247.0	2		6	8	9		17
	CLAYEY SAND (SC) mostly fine to medium sand, some low to medium plasticity fines, medium dense, dry to moist, red with dark brown [FILL].		3		8	11	12		23
10		242.0	4		10	12	15		27
	POORLY-GRADED SAND with DEBRIS (SP) mostly fine sand, with asphalt and angular stone (2" maximum) in sample, medium dense, dry, brown [FILL].								
15		237.0	5		14	17	20		37
	CLAYEY SAND (SC) mostly fine to medium sand, some low to medium plasticity fines, dessicated, dense, dry to moist, red with brown [TERTIARY TERRACE].								
20	- - - With rounded gravel (1" maximum) in sample, moist, brown with red and light gray.	232.0	6		15	17	19		36
25	- - - Fine to coarse sand, medium dense, light reddish brown with light gray.	227.0	7		8	9	9		18
30		222.0	8		6	7	9		16
35	- - - Little medium plasticity fines, loose, wet, light reddish brown.	217.0	9		5	5	4		9
40	**CLAYEY SAND with GRAVEL (SC)** mostly fine to coarse sand, some medium plasticity fines, few subrounded gravels (1" maximum dimension), dense, moist to wet, reddish orange.	212.0	10		12	17	21		38
45	**LEAN CLAY with SAND (CL)** mostly medium to high plasticity kaolinitic fines, little fine to medium sand, micaceous, very hard, moist, light gray with yellow [CRETACEOUS SANDS & CLAYS].	207.0	11		15	29	43		72
			12		12	27	37		64



S&ME BORING LOG - VOGTLE DMSB BORING LOGS.GPJ S&ME 2009_09_24.GDT 12/10/10

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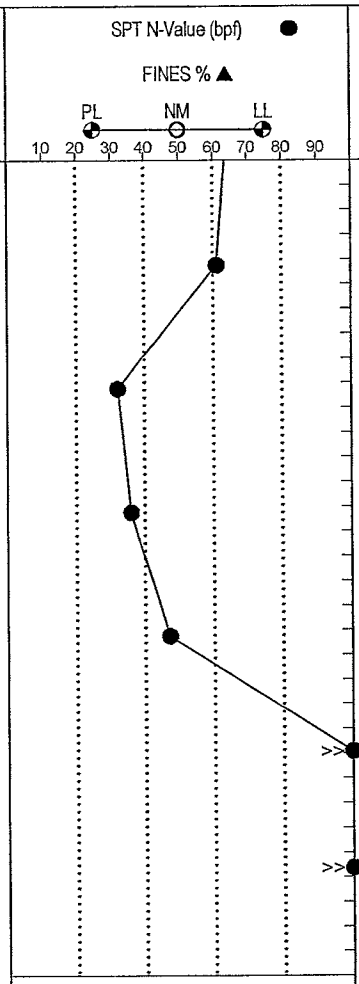
4. *WATER LEVEL IS AT TIME OF EXPLORATION AND WILL VARY.*

S&ME

PROJECT:	Darla Moore School of Business Columbia, SC S&ME Project No. 1611-10-426	BORING LOG: B-7
DATE DRILLED: 11/10/10	ELEVATION: 252.0 ft	NOTES: Elevations estimated from provided site topographic plan. No survey of boring locations or elevations conducted by S&ME.
DRILL RIG: CME 45-B	BORING DEPTH: 83.0 ft	
DRILLER: Wessinger	WATER LEVEL: 29.9' 11/11/10, 29.9' 12/7/10	
HAMMER TYPE: Safety	LOGGED BY: M. Glunt	
SAMPLING METHOD: Split spoon		NORTHING: EASTING:
DRILLING METHOD: 2¼" H.S.A.		

DEPTH (feet)	MATERIAL DESCRIPTION	ELEVATION (feet-MSL)	SAMPLE NO.	SAMPLE TYPE	BLOW COUNT / CORE DATA 1st 6in / RUN #	2nd 6in / REC	3rd 6in / RQD	4th 6in	N VALUE
	[CRETACEOUS SANDS & CLAYS]								
55	**CLAYEY SAND (SC)** mostly fine to medium sand, little low to medium plasticity fines, very dense, wet, tan.	197.0	13		11	29	32		61
60	- - - Some medium plasticity kaolinitic fines, micaceous, dense, moist, light gray with tan.	192.0	14		10	15	17		32
65	**SANDY SILT (ML)** mostly low plasticity fines, some fine to coarse sand, micaceous, hard, moist, white with yellow [PIEDMONT RESIDUUM].	187.0	15		11	17	19		36
70		182.0	16		14	20	27		47
75	**PARTIALLY WEATHERED ROCK sampled as SILTY SAND (SM)** mostly fine to coarse sand, some low plasticity fines, with fine angular quartz fragments, micaceous, very hard, moist, white with orange.	177.0	17		30	50/4"			>>50/4"
80		172.0	18		50/3"				>>50/3"
	- - - Auger Refusal at 83.0 ft. Boring terminated at 83 feet								



WATER LEVEL

S&ME BORING LOG - VOGTLE DMSB BORING LOGS.GPJ S&ME 2009_09_24.GDT 12/10/10

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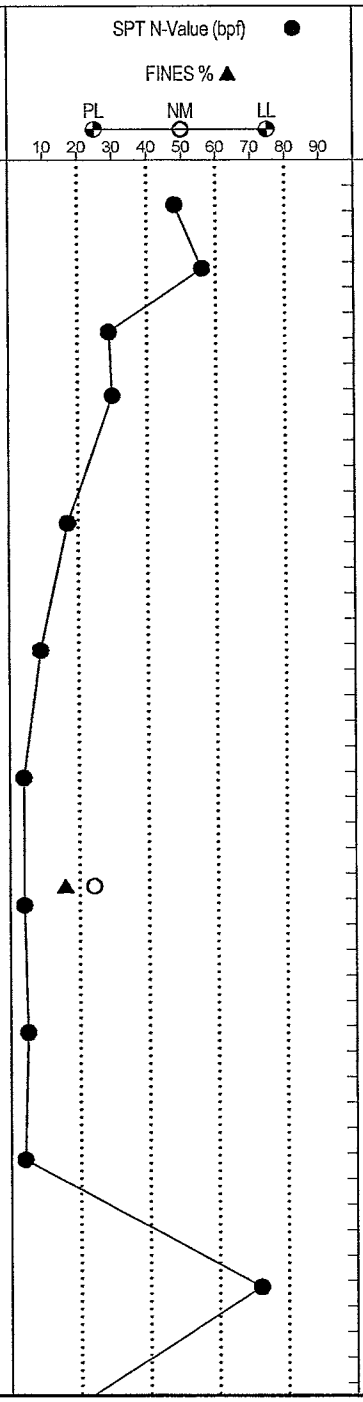
S&ME

PROJECT:	Darla Moore School of Business Columbia, SC S&ME Project No. 1611-10-426	BORING LOG: B-8
DATE DRILLED: 11/11/10	ELEVATION: 247.0 ft	NOTES: Elevations estimated from provided site topographic plan. No survey of boring locations or elevations conducted by S&ME.
DRILL RIG: CME 45-B	BORING DEPTH: 83.0 ft	
DRILLER: Wessinger	WATER LEVEL: 27.4 ft. @ TOB	
HAMMER TYPE: Safety	LOGGED BY: M. Glunt	
SAMPLING METHOD: Split spoon		NORTHING: / EASTING:
DRILLING METHOD: 2¼" H.S.A.		

DEPTH (feet)	MATERIAL DESCRIPTION	ELEVATION (feet-MSL)	SAMPLE NO.	SAMPLE TYPE	BLOW COUNT / CORE DATA 1st 6in / RUN #	2nd 6in / REC	3rd 6in / RQD	4th 6in	N VALUE
	Approximately 6 inches of concrete (sidewalk)		1		16	22	26		48
5	**POORLY-GRADED SAND (SP)** mostly fine sand, trace low plasticity fines, dense, dry, brown [FILL].	242.0	2		19	22	34		56
	CLAYEY SAND (SC) mostly fine to medium sand, some low to medium plasticity fines, dessicated, very dense, dry to moist, red with brown [TERTIARY TERRACE].		3		13	12	17		29
10	- - - With angular quartz fragments (2" maximum dimension), medium dense.	237.0	4		11	14	16		30
	- - - With light gray mottles.								
15	- - - Fine to coarse sand, with subrounded quartz pebbles, moist, light brownish red with white.	232.0	5		6	8	9		17
20	- - - Fine to medium sand, little low to medium plasticity fines, loose.	227.0	6		4	4	5		9
25	- - - Fine to coarse sand, very loose, wet, tannish orange.	222.0	7		2	2	2		4
30	- - - Medium to coarse sand, with fine angular quartz gravels.	217.0	8		3	2	2		4
35		212.0	9		2	3	2		5
40	**LEAN CLAY with SAND (CL)** mostly medium plasticity kaolinitic fines, little fine sand, micaceous, soft, moist, gray with orange [CRETACEOUS SANDS & CLAYS].	207.0	10		2	2	2		4
45	- - - Very hard.	202.0	11		15	30	42		72



WATER LEVEL ▽

S&ME BORING LOG - VOGTLE DMSB BORING LOGS.GPJ S&ME 2009_09_24.GDT 12/10/10

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S&ME

PROJECT:	Darla Moore School of Business Columbia, SC S&ME Project No. 1611-10-426	BORING LOG: B-8
DATE DRILLED: 11/11/10	ELEVATION: 247.0 ft	NOTES: Elevations estimated from provided site topographic plan. No survey of boring locations or elevations conducted by S&ME.
DRILL RIG: CME 45-B	BORING DEPTH: 83.0 ft	
DRILLER: Wessinger	WATER LEVEL: 27.4 ft. @ TOB	
HAMMER TYPE: Safety	LOGGED BY: M. Glunt	
SAMPLING METHOD: Split spoon		NORTHING: EASTING:
DRILLING METHOD: 2¼" H.S.A.		

DEPTH (feet)	GRAPHIC LOG	MATERIAL DESCRIPTION	WATER LEVEL	ELEVATION (feet-MSL)	SAMPLE NO.	SAMPLE TYPE	BLOW COUNT / CORE DATA 1st 6in / RUN #	2nd 6in / REC	3rd 6in / RQD	4th 6in	SPT N-Value (bpf) ● FINES % ▲ (PL NM LL; 10 20 30 40 50 60 70 80 90)	N VALUE
50		**CLAYEY SAND (SC)** mostly fine to medium sand, little medium plasticity fines, micaceous, medium dense, wet, tannish gray with orange.		197.0	12		6	8	7			15
55		**SANDY LEAN CLAY (CL)** mostly medium plasticity kaolinitic fines, some fine to medium sand (interbedded seams), micaceous, very stiff, moist to wet, gray with orange.		192.0	13		8	7	9			16
60		**PARTIALLY WEATHERED ROCK sampled as SANDY SILT (ML)** mostly low plasticity fines, some fine to coarse sand, micaceous, very hard, moist, white with yellow [PIEDMONT RESIDUUM].		187.0	14		22	34	50/4.5"			>> 50/4.5"
65				182.0	15		21	39	50/5"			>> 50/5"
70		- - - Orange with black.		177.0	16		17	29	50/5"			>> 50/5"
75				172.0	17		19	50/5.5"				>> 50/5.5"
80		- - - No recovery.		167.0	18		50/0"					>> 50/0"
		- - - Auger Refusal at 83.0 feet. Boring terminated at 83 feet										

S&ME BORING LOG - VOGTLE DMSB BORING LOGS.GPJ S&ME 2009_09_24.GDT 12/10/10

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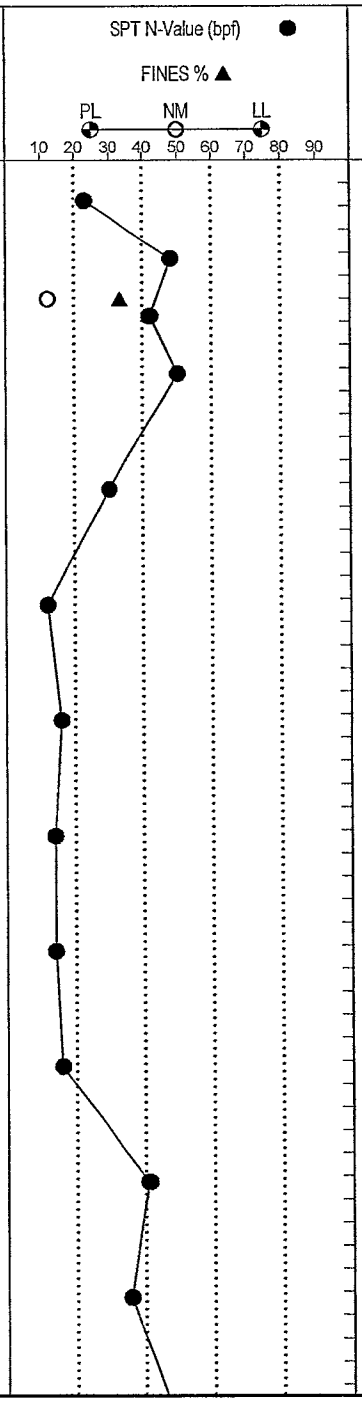
4. *WATER LEVEL IS AT TIME OF EXPLORATION AND WILL VARY.*

S&ME

PROJECT:	Darla Moore School of Business Columbia, SC S&ME Project No. 1611-10-426	BORING LOG: B-9
DATE DRILLED: 11/11/10	ELEVATION: 263.0 ft	NOTES: Elevations estimated from provided site topographic plan. No survey of boring locations or elevations conducted by S&ME.
DRILL RIG: CME 45-B	BORING DEPTH: 97.5 ft	
DRILLER: Wessinger	WATER LEVEL: 51.8 ft. @ TOB	
HAMMER TYPE: Safety	LOGGED BY: M. Glunt	
SAMPLING METHOD: Split spoon		NORTHING: / EASTING:
DRILLING METHOD: 2¼" H.S.A.		

DEPTH (feet)	MATERIAL DESCRIPTION	ELEVATION (feet-MSL)	SAMPLE NO.	SAMPLE TYPE	1st 6in / RUN #	2nd 6in / REC	3rd 6in / RQD	4th 6in	N VALUE
	Approximately 6 inches of topsoil.								
	CLAYEY SAND (SC) mostly fine to medium sand, some medium plasticity fines, medium dense, dry, brownish red [TERTIARY TERRACE].		1		9	9	14		23
5	--- Dense, red with brown.	258.0	2		19	22	26		48
	--- Dry to moist, with light gray.		3		17	20	22		42
10		253.0	4		19	23	27		50
15	--- Medium dense.	248.0	5		9	13	17		30
20	**CLAYEY SAND with GRAVEL (SC)** mostly fine to coarse sand, some low to medium plasticity fines, with rounded gravel and angular quartz fragments, medium dense, moist, light brownish red with white.	243.0	6		5	5	7		12
25		238.0	7		6	7	9		16
30		233.0	8		8	6	8		14
35	--- With 2" quartz fragment in sample.	228.0	9		6	6	8		14
40	--- Moist to wet.	223.0	10		7	8	8		16
45	**SANDY LEAN CLAY (CL)** mostly medium plasticity fines, some fine to medium sand, micaceous, hard, moist, orange and light gray [CRETACEOUS SANDS & CLAYS].	218.0	11		11	17	24		41
50	--- Some fine to coarse sand.	213.0	12		12	15	21		36

WATER LEVEL ▽



S&ME BORING LOG - VOGTLE DMSB BORING LOGS.GPJ S&ME 2009_09_24.GDT 12/10/10

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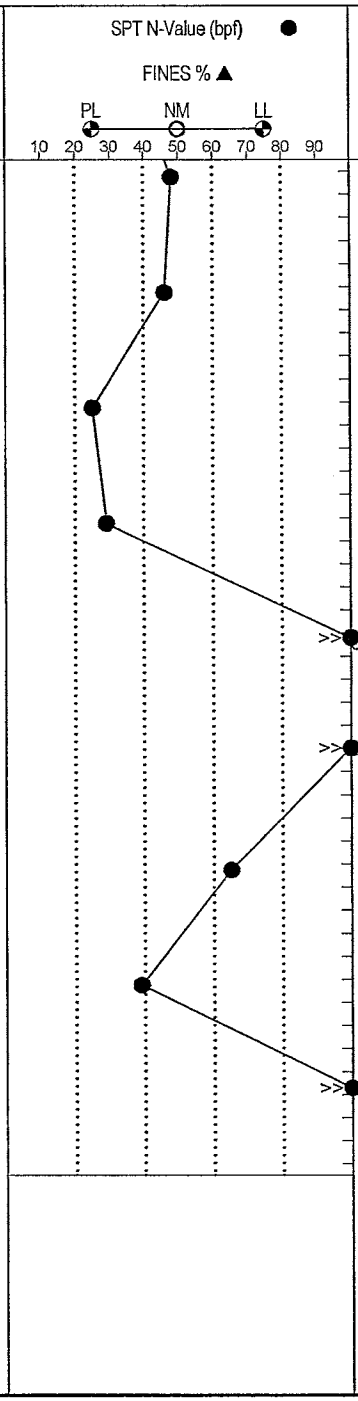
S&ME

PROJECT: Darla Moore School of Business Columbia, SC S&ME Project No. 1611-10-426	BORING LOG: B-9

DATE DRILLED: 11/11/10	ELEVATION: 263.0 ft	NOTES: Elevations estimated from provided site topographic plan. No survey of boring locations or elevations conducted by S&ME.
DRILL RIG: CME 45-B	BORING DEPTH: 97.5 ft	
DRILLER: Wessinger	WATER LEVEL: 51.8 ft. @ TOB	
HAMMER TYPE: Safety	LOGGED BY: M. Glunt	
SAMPLING METHOD: Split spoon		NORTHING: EASTING:
DRILLING METHOD: 2¼" H.S.A.		

DEPTH (feet)	MATERIAL DESCRIPTION	WATER LEVEL	ELEVATION (feet-MSL)	SAMPLE NO.	SAMPLE TYPE	BLOW COUNT / CORE DATA 1st 6in / RUN #	2nd 6in / REC	3rd 6in / RQD	4th 6in	N VALUE
55	**LEAN CLAY with SAND (CL)** mostly medium plasticity fines, little fine to medium sand, micaceous, hard, moist, light gray with orange [CRETACEOUS SANDS & CLAYS]		208.0	13		12	23	25		48
60			203.0	14		11	20	26		46
65	**CLAYEY SAND (SC)** mostly fine to medium sand, some medium plasticity fines, micaceous, medium dense, wet, light gray with orange.		198.0	15		11	12	13		25
70			193.0	16		12	13	16		29
75	**PARTIALLY WEATHERED ROCK (PWR) sampled as SANDY SILT (ML)** mostly low plasticity fines, some fine to medium sand, micaceous, very hard, moist, white with yellow [PIEDMONT RESIDUUM].		188.0	17		16	28	50/5.5"		>>50/5.5"
80	- - - Some fine to coarse sand, with orange.		183.0	18		29	50/5"			>>50/5"
85	**SANDY SILT (ML)** mostly low plasticity fines, some fine to medium sand, micaceous, very hard, moist, orange with white.		178.0	19		17	26	39		65
90	- - - Hard, dark gray and orange speckled.		173.0	20		14	17	22		39
95	**PWR sampled as SANDY SILT (ML)** mostly low plasticity fines, some fine to coarse sand, micaceous, very hard, moist to wet, dark gray with light gray.		168.0	21		50/5"				>>50/5"
	- - - Auger Refusal at 97.5 feet. Boring terminated at 97.5 feet									



S&ME BORING LOG - VOGTLE DMSB BORING LOGS.GPJ S&ME 2009_09_24.GDT 12/10/10

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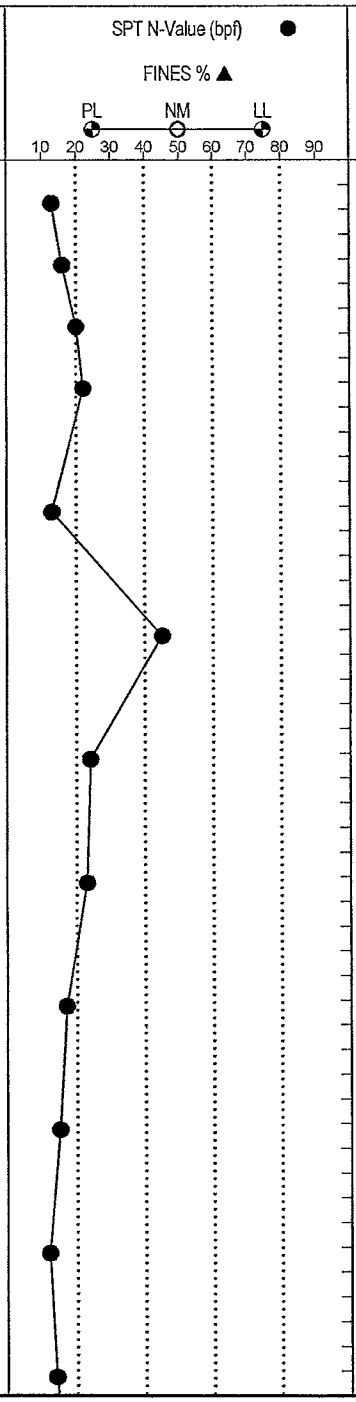
S&ME

PROJECT: Darla Moore School of Business Columbia, SC S&ME Project No. 1611-10-426	BORING LOG: B-10

DATE DRILLED: 11/12/10	ELEVATION: 282.0 ft	NOTES: Elevations estimated from provided site topographic plan. No survey of boring locations or elevations conducted by S&ME.
DRILL RIG: CME 45-B	BORING DEPTH: 123.0 ft	
DRILLER: Wessinger	WATER LEVEL: 61.8' @ TOB, 62.2' 11/15/10	
HAMMER TYPE: Safety	LOGGED BY: M. Glunt	
SAMPLING METHOD: Split spoon		NORTHING: / EASTING:
DRILLING METHOD: 2¼" H.S.A.		

DEPTH (feet)	MATERIAL DESCRIPTION	ELEVATION (feet-MSL)	SAMPLE NO.	SAMPLE TYPE	BLOW COUNT / CORE DATA 1st 6in / RUN #	2nd 6in / REC	3rd 6in / RQD	4th 6in	N VALUE
	Approximately 4 inches of concrete								
	CLAYEY SAND (SC) mostly fine to medium sand, some low to medium plasticity fines, dessicated, medium dense, dry to moist, dark red [TERTIARY TERRACE]. - - - Little low plasticity fines.		1		3	5	8		13
5		277.0	2		3	6	10		16
			3		7	10	10		20
10		272.0	4		8	10	12		22
15	**POORLY-GRADED SAND with CLAY (SP/SC)** mostly fine to medium sand, few low plasticity fines, medium dense, dry to moist, brownish red.	267.0	5		6	6	7		13
20	**CLAYEY SAND (SC)** mostly fine to medium sand, some medium plasticity fines, dense, moist, red with brown and gray.	262.0	6		18	20	25		45
25	**SANDY LEAN CLAY (CL)** mostly medium plasticity fines, some fine to medium sand, very stiff, moist, light gray with red and brown.	257.0	7		8	11	13		24
30		252.0	8		10	9	14		23
35	**CLAYEY SAND (SC)** mostly fine sand, some low to medium plasticity fines, medium dense, moist, light brownish red.	247.0	9		6	8	9		17
40		242.0	10		8	7	8		15
45	**CLAYEY SAND with GRAVEL (SC)** mostly fine to coarse sand, some low to medium plasticity fines, with angular quartz fragments (2" maximum), medium dense, moist, light brown with gray.	237.0	11		6	5	7		12
			12		7	6	8		14



WATER LEVEL

S&ME BORING LOG - VOGTLE DMSB BORING LOGS.GPJ S&ME 2009_09_24.GDT 12/10/10

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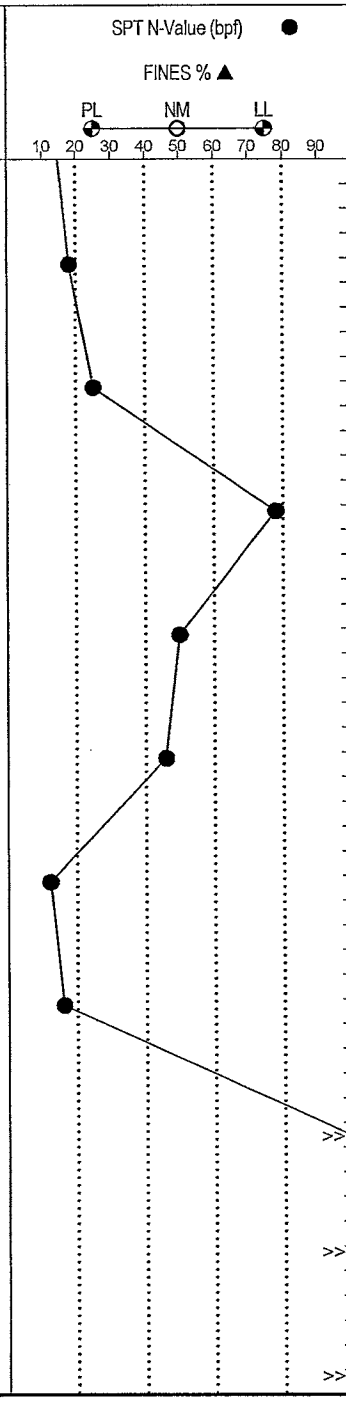
S&ME

PROJECT: Darla Moore School of Business Columbia, SC S&ME Project No. 1611-10-426	BORING LOG: B-10

DATE DRILLED: 11/12/10	ELEVATION: 282.0 ft	NOTES: Elevations estimated from provided site topographic plan. No survey of boring locations or elevations conducted by S&ME.
DRILL RIG: CME 45-B	BORING DEPTH: 123.0 ft	
DRILLER: Wessinger	WATER LEVEL: 61.8' @ TOB, 62.2' 11/15/10	
HAMMER TYPE: Safety	LOGGED BY: M. Glunt	
SAMPLING METHOD: Split spoon		NORTHING: / EASTING:
DRILLING METHOD: 2¼" H.S.A.		

DEPTH (feet)	MATERIAL DESCRIPTION	ELEVATION (feet-MSL)	SAMPLE NO.	SAMPLE TYPE	BLOW COUNT / CORE DATA 1st 6in / RUN #	2nd 6in / REC	3rd 6in / RQD	4th 6in	N VALUE
	--- Fine quartz fragments.								
	[TERTIARY TERRACE]								
55	--- Angular quartz fragments (2" maximum), light red with white.	227.0	13		15	9	9		18
60	--- With light brown and black.	222.0	14		13	11	14		25
65	**CLAYEY SAND (SC)** mostly fine to coarse sand, some medium plasticity fines, micaceous, very dense, moist to wet, light gray [CRETACEOUS SANDS & CLAYS].	217.0	15		22	30	48		78
70	--- Dense, with orange.	212.0	16		12	18	32		50
75		207.0	17		14	17	29		46
80	--- Little low to medium plasticity fines, medium dense, wet, with light red.	202.0	18		15	8	4		12
85	**SANDY SILT (ML)** mostly low plasticity fines, some fine to medium sand, micaceous, very stiff, moist, white with yellow [PIEDMONT RESIDUUM].	197.0	19		11	9	7		16
90	**PARTIALLY WEATHERED ROCK (PWR) sampled as SANDY SILT (ML)** mostly low plasticity fines, some fine to medium sand, micaceous, very hard, moist, white with yellow and orange.	192.0	20		25	30	50/5"		>>50/5"
95		187.0	21		23	31	50/4.5"		>>50/4.5"
	--- Some fine sand, dark gray with light gray and yellow speckled.		22		29	32	50/5.5"		>>50/5.5"



WATER LEVEL

S&ME BORING LOG - VOGTLE DMSB BORING LOGS.GPJ S&ME 2009_09_24.GDT 12/10/10

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S&ME

PROJECT:	Darla Moore School of Business Columbia, SC S&ME Project No. 1611-10-426	BORING LOG: B-10
DATE DRILLED: 11/12/10	ELEVATION: 282.0 ft	NOTES: Elevations estimated from provided site topographic plan. No survey of boring locations or elevations conducted by S&ME.
DRILL RIG: CME 45-B	BORING DEPTH: 123.0 ft	
DRILLER: Wessinger	WATER LEVEL: 61.8' @ TOB, 62.2' 11/15/10	
HAMMER TYPE: Safety	LOGGED BY: M. Glunt	
SAMPLING METHOD: Split spoon		NORTHING: / EASTING:
DRILLING METHOD: 2¼" H.S.A.		

DEPTH (feet)	MATERIAL DESCRIPTION	ELEVATION (feet-MSL)	SAMPLE NO.	SAMPLE TYPE	BLOW COUNT / CORE DATA 1st 6in / RUN #	2nd 6in / REC	3rd 6in / RQD	4th 6in	N VALUE
	[PARTIALLY WEATHERED ROCK]								
105		177.0	23		30	36	50/5"		>>50/5"
110	**SANDY SILT (ML)** mostly low plasticity fines, some fine sand, micaceous, very hard, moist, dark gray with black and yellow speckled.	172.0	24		30	34	49		83
115	- - - With angular quartz fragments, orange with white.	167.0	25		31	36	48		84
120	**PWR sampled as SILTY SAND (SM)** mostly fine to coarse sand, some low plasticity fines, micaceous, very dense, moist, gray with white.	162.0	26		37	50/4"			>>50/4"
	- - - Auger Refusal at 123.0 feet. Boring terminated at 123 feet								

SPT N-Value (bpf) ●
FINES % ▲
PL NM LL
10 20 30 40 50 60 70 80 90

S&ME BORING LOG - VOGTLE DMSB BORING LOGS.GPJ S&ME 2009_09_24.GDT 12/10/10

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APPENDIX C

SUMMARY OF LABORATORY PROCEDURES

LABORATORY EXAMINATION AND ARCHIVING OF SAMPLES

Examination of Split Spoon Soil Samples – Recovered field samples and field boring logs were reviewed in the laboratory by the geotechnical engineer. Soils were classified in general accordance with the visual-manual method described in ASTM D 2488, "Standard Practice for Description and Identification of Soils (Visual-Manual Method)." With this information, the geotechnical engineer prepared the final boring logs enclosed with this report.

Sample Retention - Recovered samples not suspected of contamination and not expended in laboratory tests are commonly retained in our laboratory for 90 days following completion of drilling. Samples are then disposed of at our convenience, unless specifically requested by our client.

LABORATORY PHYSICAL TESTS OF RECOVERED SAMPLES

Liquid and Plastic Limits Testing – The liquid limit of each sample was determined using the multipoint method (Method A) described in ASTM D 4318 Section 11. The plastic limit was determined using the procedure described in Section 17. Atterberg limits tests were performed to 1) assist in classification of soil samples using the Unified Soil Classification System, or 2) provide some empirical evaluation of suitability of the soils for use as compacted fill, or 3) evaluate suitability of the soils for use as subgrade material below floor slabs or pavements.

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.

Grain Size Analysis of Samples - The distribution of particle sizes was determined in general accordance with the procedures described by ASTM D 421, "Standard Practice for Dry Preparation of Soil Samples for Particle-Size Analysis and Determination of Soil Constants", and D 422, "Standard Test Method for Particle Size Analysis of Soils."

Compaction Tests of Soils Using Standard Effort – Soil placed as engineering fill is compacted to a dense state to obtain satisfactory engineering properties. Laboratory compaction tests provide the basis for determining the percent compaction and water content needed to achieve the required engineering properties, and for controlling construction to assure the required compaction and water contents are achieved. Test procedures generally followed those described by ASTM D 698, *"Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 lbf/ft^3)."*

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 roadway 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.*"

Consolidation Tests of Undisturbed Samples - The data from the consolidation test are used to estimate the magnitude and rate of both total and differential settlement of a structure or earthfill. In this test method a saturated soil specimen is restrained laterally by a steel mold and loaded axially with total stress increments. As the specimen consolidates, measurements are made of the change in specimen height and plotted vs. time to determine the relationship between the effective stress and void ratio or strain, and the time rate at which consolidation occurs.

Procedures for determining the magnitude and rate of consolidation of laterally restrained soil generally followed those described in ASTM D 2435, "*Standard Test Method for One-Dimensional Consolidation of Soils.*" Extruded samples were each trimmed to a disc 2.5 inches in diameter and 1.0 inches thick as described in Section 9. Each disc was confined in a stainless steel ring and sandwiched between two porous stone plates. After application of a seating load of 100 lb/ft^2 to confine the specimen, the ring was placed in an oedometer and the sample immersed in water to full saturation.

Prepared specimens were loaded to the desired stress in accordance with one of the standard loading schedules ("A" or "B") described in Section 11.5 and indicated on the attached test reports, then unloaded in four equal decrements. Resulting deformation of the sample was measured using a micrometer dial gage.

Time deformation properties were plotted for each load increment using either the log time or square root of time methods described in Section 12.3 and the *coefficient of consolidation* C_v computed. Load deformation properties were plotted in terms of void ratio at 100 percent consolidation for each loading increment vs. applied load. The graphical representation of the sample load-deflection curves was corrected for sample disturbance using the Schmertmann (1955) approach and the Becker (1997) work per unit volume approach. The *preconsolidation stress* p_c of the specimen was estimated from this plot using the Casagrande construction described in Section 12.4.6. The *compression index* C_c was estimated from the straight line portion of the semilog consolidation curve, above the preconsolidation stress.

Form No: TR-D1140-2
Revision No. 0
Revision Date: 10/26/07

Material Finer than the #200 Sieve

S&ME

ASTM D1140 — ***Quality Assurance***

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

Project #:	**1611-10-426**	Report Date:	11/29/10
Project Name:	Darla Moore School of Business	Test Date(s):	11/23/10-11/29/10
Client Name:	University of South Carolina, Campus Planning and Constr.		
Client Address:	743 Greene Street, Columbia, South Carolina 29208		
Sample by:	Matt Glunt	Sample Dates:	11/9/10
Sampling Method:	Borings		

Boring No.	3	Sample No.	2	Sample Depth:	3.5'-5.0'
Sample Description	Clayey Sand (SC) low to medium plasticity, fine to medium sand, red with brown and gray				
☐ *Auxiliary*		*#200 Wash*	Method A ☒	Method B ☐	
	Tare #:	56	Soaked ☒	*Soak Time*	6 hrs.
	Tare Wt. (T)	0.00	Original Dry Mass of Sample (B)		**172.76**
	Wet Wt + T	203.01	After 200 Wash + Tare Wt. (C_T)		115.07
	Dry Wt + T	172.76	Dry Mass Retained on #200 Sieve (C)		**115.07**
	Moisture Content (MC)	**17.5%**	**% Passing #200 Sieve (A)**		**33.4%**

Boring No.	3	Sample No.	12	Sample Depth:	48.5'-50.0'
Sample Description	Clayey Sand (SC) low to medium plasticity, fine to coarse sand, light gray with yellow				
☐ *Auxiliary*		*#200 Wash*	Method A ☒	Method B ☐	
	Tare #:	69	Soaked ☒	*Soak Time*	6 hrs.
	Tare Wt. (T)	0.00	Original Dry Mass of Sample (B)		**280.78**
	Wet Wt (W) + T	333.41	After 200 Wash + Tare Wt. (C_T)		221.45
	Dry Wt (D) + T	280.78	Dry Mass Retained on #200 Sieve (C)		**221.45**
	Moisture Content (MC)	**18.7%**	**% Passing #200 Sieve (A)**		**21.1%**

Boring No.	4	Sample No.	13	Sample Depth:	53.5'-55.0'
Sample Description	Sandy Lean Clay (CL) low plasticity, fine to medium sand, light gray and white				
☐ *Auxiliary*		*#200 Wash*	Method A ☒	Method B ☐	
	Tare #:	61	Soaked ☒	*Soak Time*	6 hrs.
	Tare Wt. (T)	0.00	Original Dry Mass of Sample (B)		**64.06**
	Wet Wt (W) + T	81.54	After 200 Wash + Tare Wt. (C_T)		
	Dry Wt (D) + T	64.06	Dry Mass Retained on #200 Sieve (C)		**0.00**
	Moisture Content (MC)	**27.3%**	**% Passing #200 Sieve (A)**		

Balance ID. ***21294*** *Calibration Date:* ***1/25/10-11*** *#200 Sieve* ***21601*** *Calibration Date:* ***7/18/10***

Notes / Deviations / References: ASTM D1140: Amount of Material in Soil Finer Than the No. 200 (75-um)) Sieve

ASTM D 2216: Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass

% Passing #200 = A = [(B-C)/B] * 100

Brian Urban	_____	103699	11/30/2010
Technician Name	*Signature*	*Certification Type/No.*	*Date*
Matt Glunt, P.E.	_____	Engineer	11/30/2010
Technical Responsibility	*Signature*	*Position*	*Date*

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Form No: TR-D1140-2
Revision No. 0
Revision Date: 10/26/07

Material Finer than the #200 Sieve

S&ME

ASTM D1140 — ***Quality Assurance***

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

Project #:	**1611-10-426**	Report Date:	11/29/10
Project Name:	Darla Moore School of Business	Test Date(s):	11/23/10-11/29/10
Client Name:	University of South Carolina, Campus Planning and Constr.		
Client Address:	743 Greene Street, Columbia, South Carolina 29208		
Sample by:	Matt Glunt	Sample Dates:	11/9/10
Sampling Method:	Borings		

Boring No. 4 — Sample No. 8 — Sample Depth: 28.5'-30.0'

Sample Description: Clayey Sand (SC) low plasticity, fine to coarse sand, orange and tan

☐ *Auxiliary* — *#200 Wash* — Method A ☒ — Method B ☐

	Tare #:	5	Soaked ☒	*Soak Time* 6 hrs.
	Tare Wt. (T)	0.00	Original Dry Mass of Sample (B)	**200.46**
	Wet Wt + T	219.97	After 200 Wash + Tare Wt. (C_T)	171.89
	Dry Wt + T	200.46	Dry Mass Retained on #200 Sieve (C)	**171.89**
	Moisture Content (MC)	**9.7%**	**% Passing #200 Sieve (A)**	**14.3%**

Boring No. 8 — Sample No. 8 — Sample Depth: 28.5'-30.0'

Sample Description: Clayey Sand (SC) low to medium plasticity, medium to coarse sand, orange and brown

☐ *Auxiliary* — *#200 Wash* — Method A ☒ — Method B ☐

	Tare #:	400	Soaked ☒	*Soak Time* 6 hrs.
	Tare Wt. (T)	0.00	Original Dry Mass of Sample (B)	**247.63**
	Wet Wt (W) + T	307.52	After 200 Wash + Tare Wt. (C_T)	208.03
	Dry Wt (D) + T	247.63	Dry Mass Retained on #200 Sieve (C)	**208.03**
	Moisture Content (MC)	**24.2%**	**% Passing #200 Sieve (A)**	**16.0%**

Boring No. 9 — Sample No. 3 — Sample Depth: 6.0'-7.5'

Sample Description: Clayey Sand (SC) medium plasticity, fine to medium sand, dark red with brown

☐ *Auxiliary* — *#200 Wash* — Method A ☒ — Method B ☐

	Tare #:	65	Soaked ☒	*Soak Time* 6 hrs.
	Tare Wt. (T)	0.00	Original Dry Mass of Sample (B)	**201.13**
	Wet Wt (W) + T	225.75	After 200 Wash + Tare Wt. (C_T)	133.96
	Dry Wt (D) + T	201.13	Dry Mass Retained on #200 Sieve (C)	**133.96**
	Moisture Content (MC)	**12.2%**	**% Passing #200 Sieve (A)**	**33.4%**

Balance ID. ***21294*** *Calibration Date:* ***1/25/10-11*** *#200 Sieve* ***21601*** *Calibration Date:* ***7/18/10***

Notes / Deviations / References: ASTM D1140: Amount of Material in Soil Finer Than the No. 200 (75-um)) Sieve

ASTM D 2216: Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass

% Passing #200 = A = [(B-C)/B] * 100

Brian Urban		103699	11/30/2010
Technician Name	*Signature*	*Certification Type/No.*	*Date*
Matt Glunt, P.E.		Engineer	11/30/2010
Technical Responsibility	*Signature*	*Position*	*Date*

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Form No: TR-D1140-2
Revision No. 0
Revision Date: 10/26/07

Material Finer than the #200 Sieve

S&ME

ASTM D1140 — ***Quality Assurance***

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

Project #:	**1611-10-426**	Report Date:	11/29/10
Project Name:	Darla Moore School of Business	Test Date(s):	11/23/10-11/29/10
Client Name:	University of South Carolina, Campus Planning and Constr.		
Client Address:	743 Greene Street, Columbia, South Carolina 29208		
Sample by:	Matt Glunt	Sample Dates:	11/9/10
Sampling Method:	Borings		

Boring No. 5 Sample No. 8 Sample Depth: 28.5'-30.0'

Sample Description Sandy Lean Clay (CL) med. plasticity, fine to medium sand, gray and white

☐ *Auxiliary* *#200 Wash* Method A ☒ Method B ☐

	Tare #:	22	Soaked ☒	*Soak Time* 6 hrs.
	Tare Wt. (T)	0.00	Original Dry Mass of Sample (B)	**58.69**
	Wet Wt + T	66.98	After 200 Wash + Tare Wt. (C_T)	
	Dry Wt + T	58.69	Dry Mass Retained on #200 Sieve (C)	**0.00**
	Moisture Content (MC)	**14.1%**	**% Passing #200 Sieve (A)**	

Boring No. 5 Sample No. 10 Sample Depth: 38.5'-40.0'

Sample Description Clayey Sand (SC) medium plasticity, medium to coarse sand, brownish-gray

☐ *Auxiliary* *#200 Wash* Method A ☒ Method B ☐

	Tare #:	72	Soaked ☒	*Soak Time* 6 hrs.
	Tare Wt. (T)	0.00	Original Dry Mass of Sample (B)	**237.63**
	Wet Wt (W) + T	280.28	After 200 Wash + Tare Wt. (C_T)	187.51
	Dry Wt (D) + T	237.63	Dry Mass Retained on #200 Sieve (C)	**187.51**
	Moisture Content (MC)	**17.9%**	**% Passing #200 Sieve (A)**	**21.1%**

Boring No. 5 Sample No. 5 Sample Depth: 13.5'-15.0'

Sample Description Clayey Sand (SC) low plasticity, fine to medium sand, orange with white

☐ *Auxiliary* *#200 Wash* Method A ☒ Method B ☐

	Tare #:	3	Soaked ☒	*Soak Time* 6 hrs.
	Tare Wt. (T)	0.00	Original Dry Mass of Sample (B)	**160.91**
	Wet Wt (W) + T	182.82	After 200 Wash + Tare Wt. (C_T)	132.28
	Dry Wt (D) + T	160.91	Dry Mass Retained on #200 Sieve (C)	**132.28**
	Moisture Content (MC)	**13.6%**	**% Passing #200 Sieve (A)**	**17.8%**

Balance ID. ***21294*** *Calibration Date:* ***1/25/10-11*** *#200 Sieve* ***21601*** *Calibration Date:* ***7/18/10***

Notes / Deviations / References: ASTM D1140: Amount of Material in Soil Finer Than the No. 200 (75-um)) Sieve

ASTM D 2216: Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass

% Passing #200 = A = [(B-C)/B] * 100

Brian Urban	_____	103699	11/30/2010
Technician Name	*Signature*	*Certification Type/No.*	*Date*
Matt Glunt, P.E.	_____	Engineer	11/30/2010
Technical Responsibility	*Signature*	*Position*	*Date*

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Form No: TR-D1140-2
Revision No. 0
Revision Date: 10/26/07

Material Finer than the #200 Sieve

S&ME

ASTM D1140 — ***Quality Assurance***

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

Project #:	**1611-10-426**	Report Date:	11/29/10
Project Name:	Darla Moore School of Business	Test Date(s):	11/23/10-11/29/10
Client Name:	University of South Carolina, Campus Planning and Constr.		
Client Address:	743 Greene Street, Columbia, South Carolina 29208		
Sample by:	Matt Glunt	Sample Dates:	11/9/10
Sampling Method:	Borings		

Boring No.	5	Sample No.	3	Sample Depth:	6.0'-7.5'
Sample Description	Clayey Sand (SC) medium to high plasticity, fine to medium sand, dark red with brown				
☐ *Auxiliary*		*#200 Wash*	Method A ☒	Method B ☐	
	Tare #:	222	Soaked ☒	*Soak Time*	6 hrs.
	Tare Wt. (T)	0.00	Original Dry Mass of Sample (B)		**98.01**
	Wet Wt + T	114.80	After 200 Wash + Tare Wt. (C_T)		
	Dry Wt + T	98.01	Dry Mass Retained on #200 Sieve (C)		**0.00**
	Moisture Content (MC)	**17.1%**	**% Passing #200 Sieve (A)**		

Boring No.	5	Sample No.	15	Sample Depth:	63.5'-65.0'
Sample Description	Sandy Silt (ML) low to medium plasticity, fine to coarse sand, white with tan				
☐ *Auxiliary*		*#200 Wash*	Method A ☒	Method B ☐	
	Tare #:	208	Soaked ☒	*Soak Time*	6 hrs.
	Tare Wt. (T)	0.00	Original Dry Mass of Sample (B)		**49.13**
	Wet Wt (W) + T	58.81	After 200 Wash + Tare Wt. (C_T)		
	Dry Wt (D) + T	49.13	Dry Mass Retained on #200 Sieve (C)		**0.00**
	Moisture Content (MC)	**19.7%**	**% Passing #200 Sieve (A)**		

Boring No.	7	Sample No.	9	Sample Depth:	33.5'-35.0'
Sample Description	Clayey Sand (SC) medium plasticity, fine to coarse sand, yellowish-orange				
☐ *Auxiliary*		*#200 Wash*	Method A ☒	Method B ☐	
	Tare #:	219	Soaked ☒	*Soak Time*	6 hrs.
	Tare Wt. (T)	0.00	Original Dry Mass of Sample (B)		**235.19**
	Wet Wt (W) + T	288.58	After 200 Wash + Tare Wt. (C_T)		173.57
	Dry Wt (D) + T	235.19	Dry Mass Retained on #200 Sieve (C)		**173.57**
	Moisture Content (MC)	**22.7%**	**% Passing #200 Sieve (A)**		**26.2%**

Balance ID. ***21294*** *Calibration Date:* ***1/25/10-11*** *#200 Sieve* ***21601*** *Calibration Date:* ***7/18/10***

Notes / Deviations / References: ASTM D1140: Amount of Material in Soil Finer Than the No. 200 (75-um)) Sieve

ASTM D 2216: Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass

% Passing #200 = A = [(B-C)/B] * 100

Brian Urban	_____	103699	11/30/2010
Technician Name	*Signature*	*Certification Type/No.*	*Date*
Matt Glunt, P.E.	_____	Engineer	11/30/2010
Technical Responsibility	*Signature*	*Position*	*Date*

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Form No: TR-D422-WH-1
Revision No. 1
Revision Date: 11/4/09

Sieve Analysis of Soils

ASTM D 422

S&ME

Quality Assurance

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

Project #:	**1613-10-426**	Report Date:	30-Nov-11
Project Name:	Darla School of Business	Test Date(s):	11/28/2010 thru 11/29/10
Client Name:	University of South Carolina, Campus Planning and Constr.		
Document ID:	743 Greene Street, Columbia, South Carolina 29208		

Boring #: 5 Sample: 5 Sample Date: 19-Nov-10

Location: B-5 Elevation: 13.5'-15.0'

Sample Description: Clayey Sand (SC) low plasticity, fine to coarse sand, orange with white

Description of Sand & Gravel Particles: Rounded ☒ Angular ☒
Hard & Durable ☒ Soft ☐ Weathered & Friable ☐

Particle Size Analysis / Without Hydrometer Analysis				*Material Excluded:*	
Tare No.	3	Tare Wt.	**0.0**	Mass of Sample after Wash + Tare Wt.	**132.3**
Total Sample Wet Wt. + Tare Wt.			**182.8**	Mass of Sample after Wash	**132.3**
Total Sample Dry Wt. + Tare Wt.			**160.9**	Mass passing #200	**28.6**
Total Sample Dry Weight			**160.9**	% Passing #200 **(D1140)**	**17.8%**

Sieve Size		**Retained Weight**	**% Retained Between Sieves**	**% Retained**	**% Passing**	**SPECS**
				Cumulative		
Standard	*mm.*	*Cumulative*	*Individual*	*Total Sample*		
2.0"	50.00	0.0	0.0%	0.0%	**100.0%**	
1.5"	37.50	0.0	0.0%	0.0%	**100.0%**	
1.0"	25.00	0.0	0.0%	0.0%	**100.0%**	
3/4"	19.00	0.0	0.0%	0.0%	**100.0%**	
1/2"	12.50	0.0	0.0%	0.0%	**100.0%**	
3/8"	9.50	5.4	3.3%	3.3%	**96.7%**	
#4	4.75	8.0	1.6%	5.0%	**95.0%**	
#8	2.360	15.9	4.9%	9.9%	**90.1%**	
#16	1.180	37.3	13.3%	23.2%	**76.8%**	
#30	0.600	69.6	20.1%	43.3%	**56.7%**	
#50	0.300	114.4	27.8%	71.1%	**28.9%**	
#100	0.150	125.6	7.0%	78.1%	**21.9%**	
#200	0.075	132.3	4.1%	82.2%	**17.8%**	
Pan	<0.075			**% Passing #200 (C136) =**		**17.8%**

D2487	Maximum Particle Size	**3/8"**	Medium Sand	< 2.00 mm and > 0.425 mm (#40)	33.4%
Gravel	< 75 mm and > 4.75 mm (#4)	**5.0%**	Fine Sand	< 0.425 mm and > 0.075 mm (#200)	38.9%
Coarse Sand	< 4.75 mm and >2.00 mm (#10)	**4.9%**	% Silt & Clay	< 0.075 mm	17.8%

Notes / Deviations / References:

Matt Glunt, P.E.		Engineer	11/30/2010
Technical Responsibility	*Signature*	*Position*	*Date*

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Form No. TR-D4318-T89-90 *Client code* *Client Test #* *state #*

Revision No. 0

Revision Date: 11/20/07

Liquid Limit, Plastic Limit, and Plastic Index

S&ME

Another code *ASTM D 4318* ☒ *AASHTO T 89* ☐ *AASHTO T 90* ☐ ***Quality Assurance***

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

Project #:	**1611-10-426**	Report Date:	11/30/10
Project Name:	Darla Moore School of Business	Test Date(s)	11/29/10-11/30/10
Client Name:	University of South Carolina, Campus Planning and Constr.		
Client Address:	743 Greene Street, Columbia, South Carolina 29208		

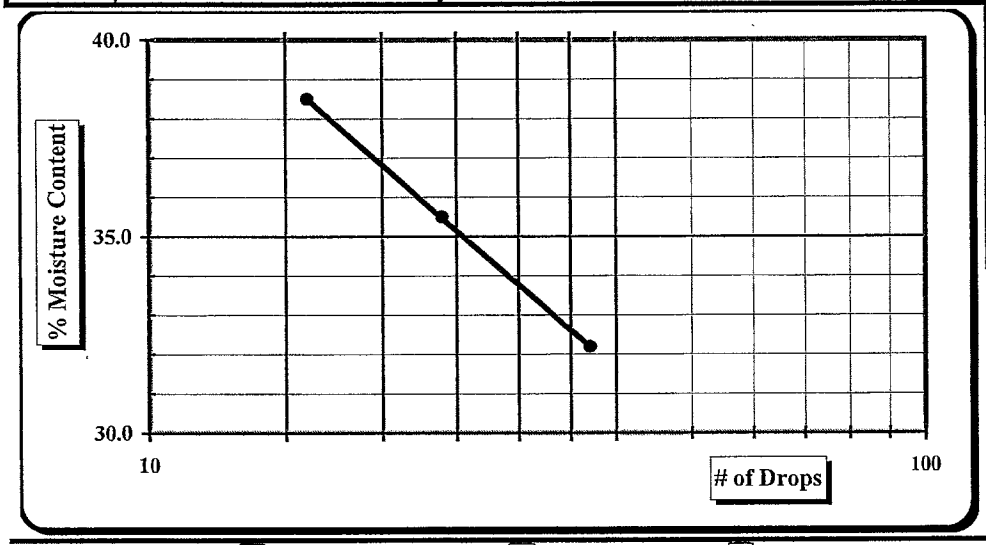
Boring #: 4 Sample #: 13 Sample Date: 11/9/10

Location: B-4 Elevation: 53.5'-55.0'

Sample Description: Sandy Lean Clay (CL) med plasticity, fine to coarse sand, white with light brown

Type and Specification	*S&ME ID #*	*Cal Date:*	*Type and Specification*	*S&ME ID #*	*Cal Date:*
Balance (0.01 g)	15425	1/8/2010-11	Grooving tool	Batch 10-1	3/1/2010-11
LL Apparatus	19460	3/1/2010-11			
Oven	21226	3/1/10-11			

Pan #		Liquid Limit						Plastic Limit		
	Tare #:	230	128	237	4	5	6	226	115	9
A	Tare Weight	13.94	13.77	13.91				13.76	13.89	
B	Wet Soil Weight + A	27.01	26.14	26.27				20.58	21.17	
C	Dry Soil Weight + A	23.38	22.90	23.26				19.44	19.96	
D	Water Weight (B-C)	3.63	3.24	3.01				1.14	1.21	
E	Dry Soil Weight (C-A)	9.44	9.13	9.35				5.68	6.07	
F	% Moisture (D/E)*100	38.5%	35.5%	32.2%				20.1%	19.9%	
N	# OF DROPS	16	24	37				*Moisture Contents determined by ASTM D 2216*		
LL	LL = F * FACTOR									
Ave.	*Average*							**20.0%**		



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 **35**

Plastic Limit **20**

Plastic Index **15**

Group Symbol **CL**

Multipoint Method ☑

One-point Method ☐

Wet Preparation ☐ Dry Preparation ☑ Air Dried ☑

Notes / Deviations / References: Note and deviations from the test method are recorded.

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

Brian Urban	11/30/2010	Matt Glunt, P.E.	11/30/2010
Technician Name	*Date*	*Technical Responsibility*	*Date*

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Form No. TR-D4318-T89-90 *Client code* *Client Test #* *state #*

Revision No. 0

Revision Date: 11/20/07

Liquid Limit, Plastic Limit, and Plastic Index

S&ME

Another code *ASTM D 4318* ☒ *AASHTO T 89* ☐ *AASHTO T 90* ☐ ***Quality Assurance***

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

Project #:	**1611-10-426**	Report Date:	11/30/10
Project Name:	Darla Moore School of Business	Test Date(s)	11/29/10-11/30/10
Client Name:	University of South Carolina, Campus Planning and Constr.		
Client Address:	743 Greene Street, Columbia, South Carolina 29208		

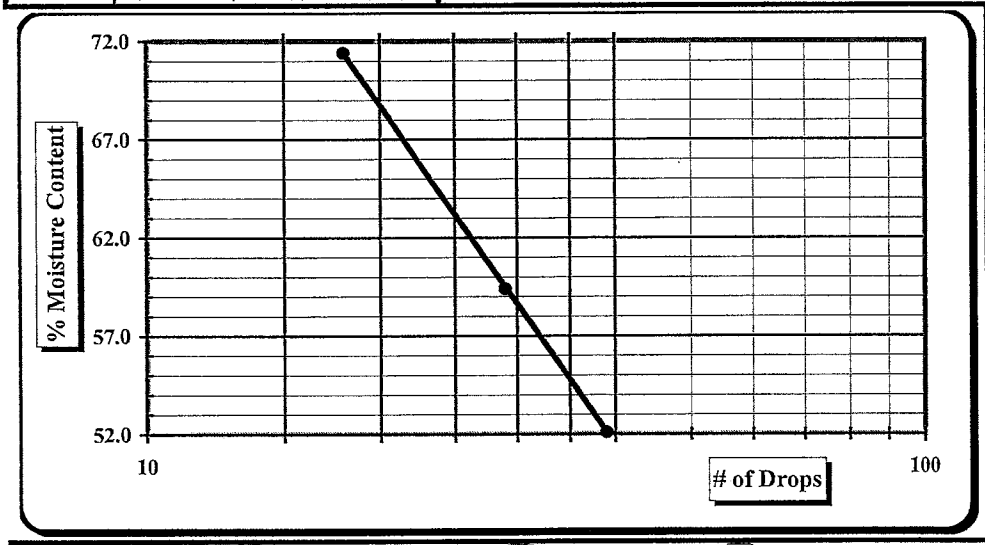
Boring #: 5 Sample #: 3 Sample Date: 11/9/10

Location: B-5 Elevation: 6.0'-7.5'

Sample Description: Clayey Sand (SC) medium plasticity, fine to medium sand, dark red with brown

Type and Specification	*S&ME ID #*	*Cal Date:*	*Type and Specification*	*S&ME ID #*	*Cal Date:*
Balance (0.01 g)	15425	1/8/2010-11	Grooving tool	Batch 10-1	3/1/2010-11
LL Apparatus	19460	3/1/2010-11			
Oven	21226	3/1/10-11			

Pan #		Liquid Limit						Plastic Limit		
	Tare #:	147	106	233	4	5	6	122	209	9
A	Tare Weight	13.64	13.71	13.83				13.81	13.94	
B	Wet Soil Weight + A	21.20	22.03	21.60				16.92	16.71	
C	Dry Soil Weight + A	18.05	18.93	18.94				16.23	16.09	
D	Water Weight (B-C)	3.15	3.10	2.66				0.69	0.62	
E	Dry Soil Weight (C-A)	4.41	5.22	5.11				2.42	2.15	
F	% Moisture (D/E)*100	71.4%	59.4%	52.1%				28.5%	28.8%	
N	# OF DROPS	18	29	39				*Moisture Contents determined by ASTM D 2216*		
LL	LL = F * FACTOR									
Ave.	*Average*							**28.7%**		



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 **63**

Plastic Limit **29**

Plastic Index **34**

Group Symbol **SC**

Multipoint Method ☑

One-point Method ☐

Wet Preparation ☐ Dry Preparation ☑ Air Dried ☑

Notes / Deviations / References: Note and deviations from the test method are recorded.

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

Brian Urban	11/30/2010	Matt Glunt, P.E.	11/30/2010
Technician Name	*Date*	*Technical Responsibility*	*Date*

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Form No. TR-D4318-T89-90 *Client code* *Client Test #* *state #*

Revision No. 0

Revision Date: 11/20/07

Liquid Limit, Plastic Limit, and Plastic Index

S&ME

Another code *ASTM D 4318* ☒ *AASHTO T 89* ☐ *AASHTO T 90* ☐ ***Quality Assurance***

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

Project #:	**1611-10-426**	Report Date:	11/30/10
Project Name:	Darla Moore School of Business	Test Date(s)	11/29/10-11/30/10
Client Name:	University of South Carolina, Campus Planning and Constr.		
Client Address:	743 Greene Street, Columbia, South Carolina 29208		

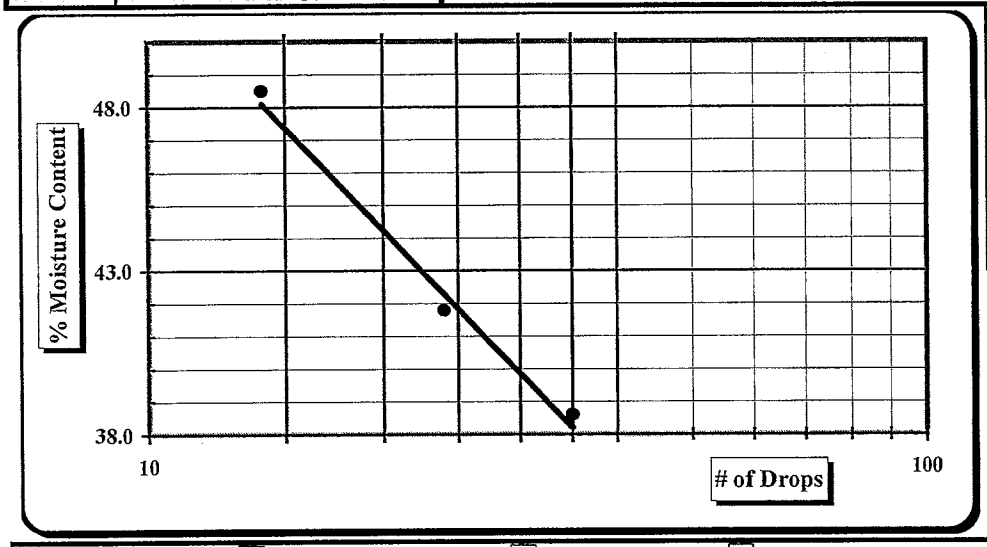
Boring #: 5 Sample #: 8 Sample Date: 11/9/10

Location: B-5 Elevation: 28.5'-30.0'

Sample Description: Sandy Lean Clay (CL) med. plasticity, fine to medium sand, gray and white

Type and Specification	*S&ME ID #*	*Cal Date:*	*Type and Specification*	*S&ME ID #*	*Cal Date:*
Balance (0.01 g)	15425	1/8/2010-11	Grooving tool	Batch 10-1	3/1/2010-11
LL Apparatus	19460	3/1/2010-11			
Oven	21226	3/1/10-11			

Pan #		Liquid Limit						Plastic Limit		
	Tare #:	10	201	235	4	5	6	114	207	9
A	Tare Weight	13.83	13.78	13.83				13.90	13.86	
B	Wet Soil Weight + A	24.37	24.56	24.06				20.57	20.88	
C	Dry Soil Weight + A	20.93	21.38	21.21				19.33	19.59	
D	Water Weight (B-C)	3.44	3.18	2.85				1.24	1.29	
E	Dry Soil Weight (C-A)	7.10	7.60	7.38				5.43	5.73	
F	% Moisture (D/E)*100	48.5%	41.8%	38.6%				22.8%	22.5%	
N	# OF DROPS	14	24	35				*Moisture Contents determined by ASTM D 2216*		
LL	LL = F * FACTOR									
Ave.	*Average*							**22.7%**		



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 **42**

Plastic Limit **23**

Plastic Index **19**

Group Symbol **CL**

Multipoint Method ☑

One-point Method ☐

Wet Preparation ☐ Dry Preparation ☑ Air Dried ☑

Notes / Deviations / References: Note and deviations from the test method are recorded.

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

Brian Urban	11/30/2010	Matt Glunt, P.E.	11/30/2010
Technician Name	*Date*	*Technical Responsibility*	*Date*

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Form No. TR-D4318-T89-90 *Client code* *Client Test #* *state #*

Revision No. 0

Revision Date: 11/20/07

Liquid Limit, Plastic Limit, and Plastic Index

S&ME

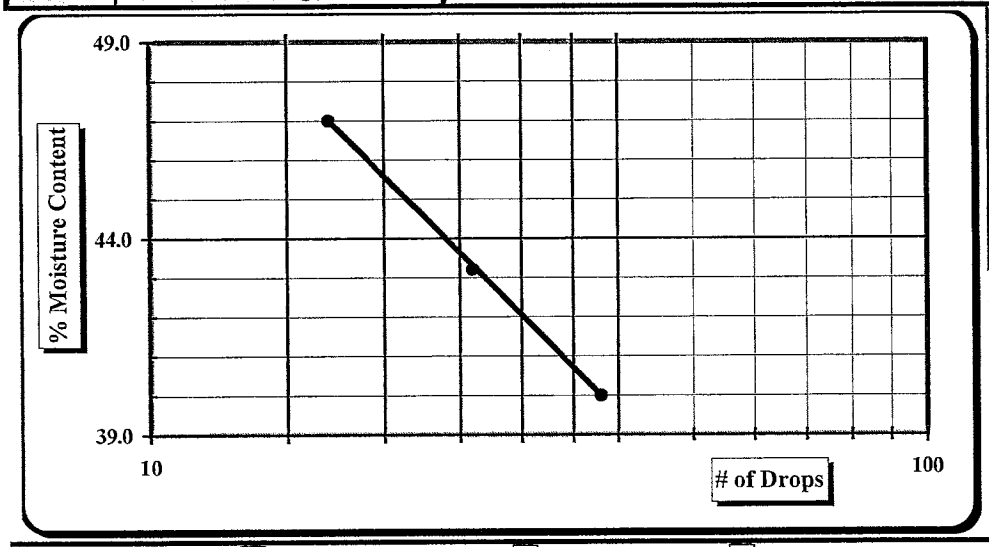
Another code *ASTM D 4318* ☒ *AASHTO T 89* ☐ *AASHTO T 90* ☐ ***Quality Assurance***

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

Project #:	**1611-10-426**	Report Date:	11/30/10
Project Name:	Darla Moore School of Business	Test Date(s)	11/29/10-11/30/10
Client Name:	University of South Carolina, Campus Planning and Constr.		
Client Address:	743 Greene Street, Columbia, South Carolina 29208		
Boring #: 5	Sample #: 15	Sample Date: 11/9/10	
Location: B-5		Elevation: 63.5'-65.0'	
Sample Description:	Sandy Silt (ML) low to medium plasticity, fine to coarse sand, white with tan		

Type and Specification	*S&ME ID #*	*Cal Date:*	*Type and Specification*	*S&ME ID #*	*Cal Date:*
Balance (0.01 g)	15425	1/8/2010-11	Grooving tool	Batch 10-1	3/1/2010-11
LL Apparatus	19460	3/1/2010-11			
Oven	21226	3/1/10-11			

Pan #		Liquid Limit						Plastic Limit		
	Tare #:	234	204	132	4	5	6	203	116	9
A	Tare Weight	13.64	13.96	13.71				13.83	13.78	
B	Wet Soil Weight + A	21.77	22.98	23.54				19.02	20.50	
C	Dry Soil Weight + A	19.17	20.26	20.73				17.79	18.92	
D	Water Weight (B-C)	2.60	2.72	2.81				1.23	1.58	
E	Dry Soil Weight (C-A)	5.53	6.30	7.02				3.96	5.14	
F	% Moisture (D/E)*100	47.0%	43.2%	40.0%				31.1%	30.7%	
N	# OF DROPS	17	26	38				*Moisture Contents determined by ASTM D 2216*		
LL	LL = F * FACTOR									
Ave.	*Average*							**30.9%**		



One Point Liquid Limit

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

NP, Non-Plastic ☐

Liquid Limit **44**

Plastic Limit **31**

Plastic Index **13**

Group Symbol **ML**

Multipoint Method ☑

One-point Method ☐

Wet Preparation ☐ Dry Preparation ☑ Air Dried ☑

Notes / Deviations / References: Note and deviations from the test method are recorded.

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

Brian Urban	11/30/2010	Matt Glunt, P.E.	11/30/2010
Technician Name	*Date*	*Technical Responsibility*	*Date*

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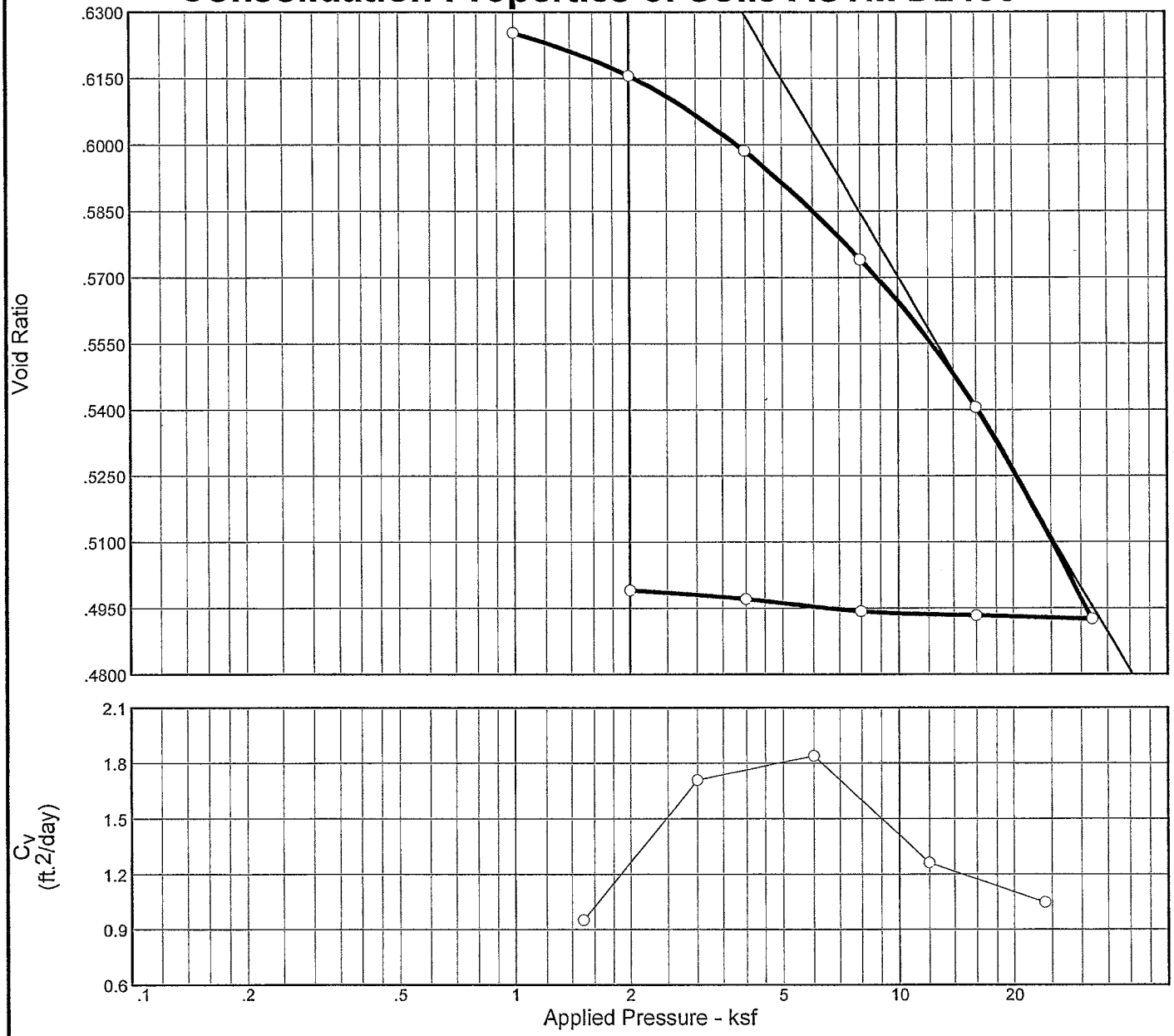
Consolidation Properties of Soils ASTM D2435



MATERIAL DESCRIPTION	USCS	AASHTO
Reddish Orange Clayey Sand (visual-manual)		

LL	PI	Sp. Gr.	Overburden (ksf)	Dry Dens. (pcf)		Moisture		Saturation		Void Ratio		P_c (ksf)	C_c
				Init.	Final	Init.	Final	Init.	Final	Init.	Final		
		2.70		103.6	114.8	18.9 %	17.2 %	81.4 %	93.2 %	0.626	0.499	5.77	0.15

Preparation Process: Trimmed with a cutting ring

Condition of Test: Inundated in the seat load

D2435 Method	C_r	Swell Press. (ksf)	Swell %
B	0.01		

Project No. 161110426 **Client:** University of South Carolina

Project: Darla Moore School of Business

Location: B-11 / UD-1 / 18-20 ft

Remarks:

"Final density" is at final seat load. S.G. value is assumed.

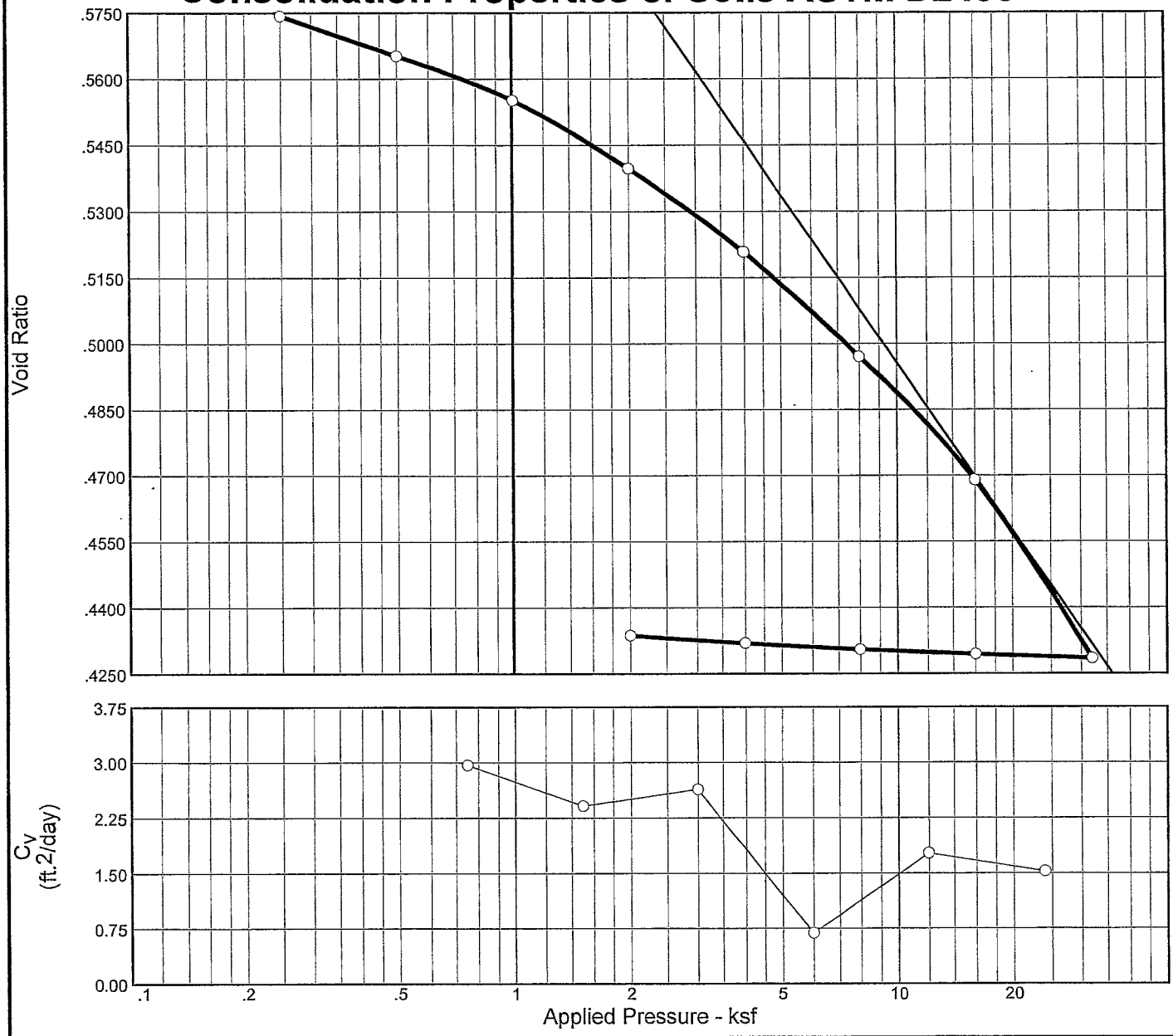
Checked By: NRR, 6/8/11

Title: Lab Dept Manager

S & ME, INC.

Louisville, TN

Consolidation Properties of Soils ASTM D2435



MATERIAL DESCRIPTION	USCS	AASHTO
Orangish Brown Sandy Clay (visual-manual)		

LL	PI	Sp. Gr.	Overburden (ksf)	Dry Dens. (pcf)		Moisture		Saturation		Void Ratio		P_c (ksf)	C_c
				Init.	Final	Init.	Final	Init.	Final	Init.	Final		
		2.70		106.4	115.7	16.3 %	16.5 %	75.2 %	100.0 %	0.585	0.434	4.32	0.13

Preparation Process: Trimmed with a cutting ring

Condition of Test: Inundated in the seat load

D2435 Method	C_r	Swell Press. (ksf)	Swell %
B	0.00		

Project No. 161110426 **Client:** University of South Carolina

Project: Darla Moore School of Business

Location: B-12 / UD-1 / 23-25 ft

Remarks:

"Final densityh" is at final seat load. S.G. value is assumed.

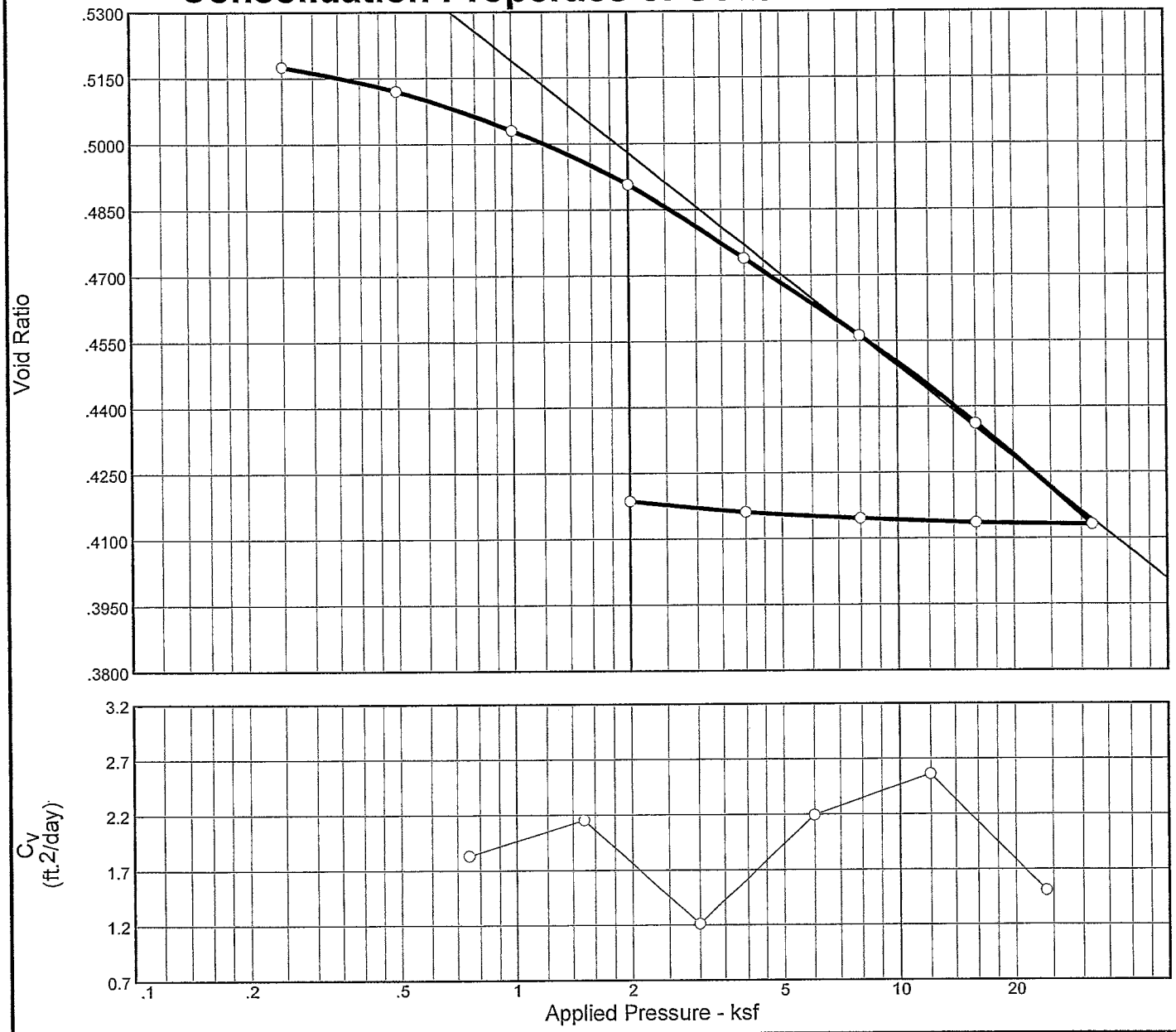
Checked By: NRR, 6/9/11

Title: Lab Dept Manager

S & ME, INC.

Louisville, TN

Consolidation Properties of Soils ASTM D2435



MATERIAL DESCRIPTION	USCS	AASHTO
Gray with Orange Sandy Clay (visual-manual)		

LL	PI	Sp. Gr.	Overburden (ksf)	Dry Dens. (pcf)		Moisture		Saturation		Void Ratio		P_c (ksf)	C_c
				Init.	Final	Init.	Final	Init.	Final	Init.	Final		
		2.70		110.8	117.6	15.1 %	15.7 %	78.2 %	100.0 %	0.521	0.419	2.91	0.07

	D2435 Method	C_r	Swell Press. (ksf)	Swell %
Preparation Process: Trimmed with a cutting ring				
Condition of Test: Inundated in the seat load	B	0.00		

Project No. 161110426 **Client:** University of South Carolina

Project: Darla Moore School of Business

Location: B-12 / UD-2 / 38-40 ft

Remarks:
"Final density" is at final seat load. S.G. value is assumed.

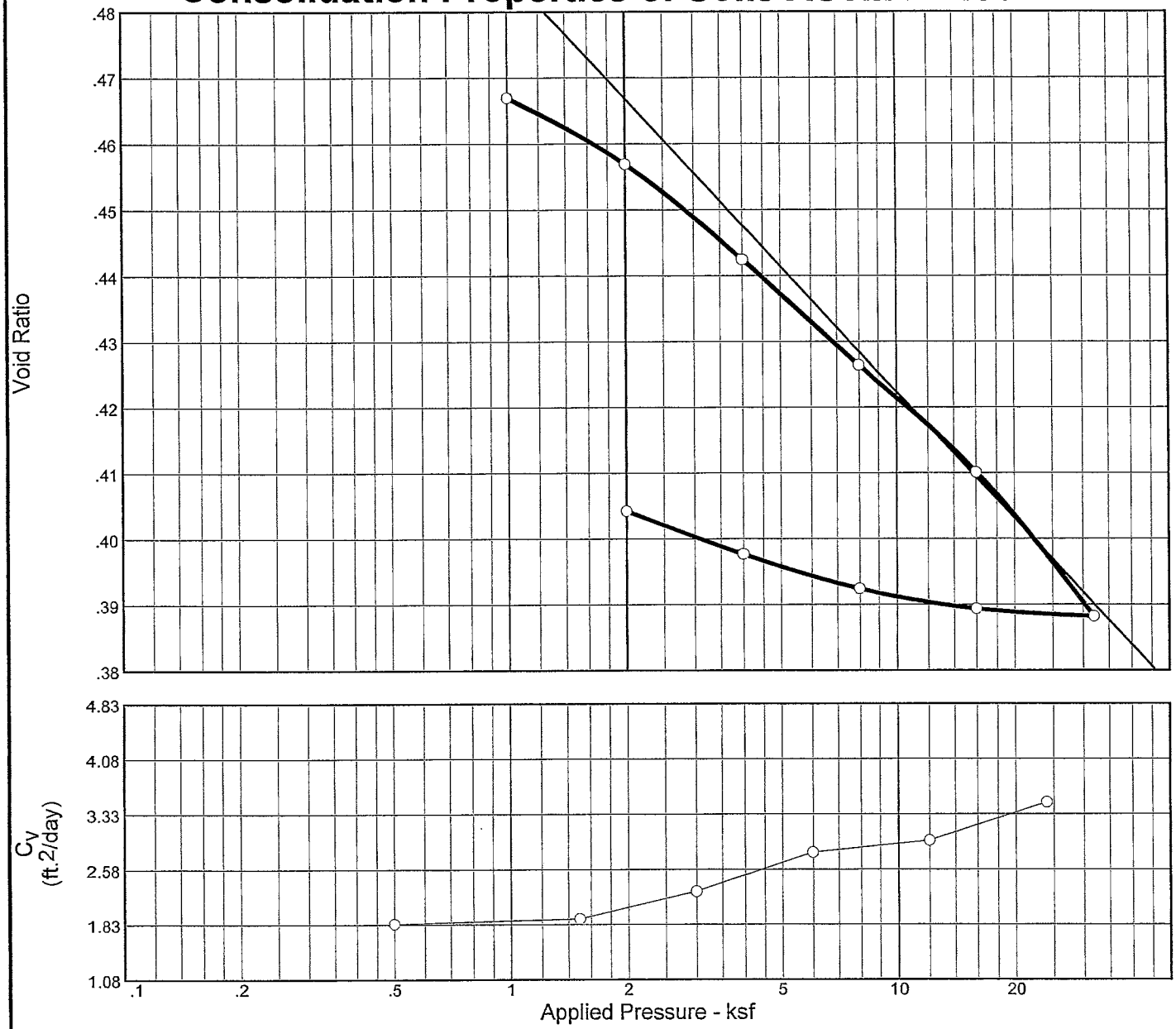
Checked By: NRR, 6/9/11

Title: Lab Dept Manager

S & ME, INC.

Louisville, TN

Consolidation Properties of Soils ASTM D2435



MATERIAL DESCRIPTION	USCS	AASHTO
Gray with Orange Silty Clay (visual-manual)		

LL	PI	Sp. Gr.	Overburden (ksf)	Dry Dens. (pcf)		Moisture		Saturation		Void Ratio		P_c (ksf)	C_c
				Init.	Final	Init.	Final	Init.	Final	Init.	Final		
		2.70		114.6	118.8	15.6 %	16.7 %	89.5 %	100.0 %	0.471	0.404	3.39	0.06

Preparation Process: Trimmed with a cutting ring

Condition of Test: inundated in the seat load

D2435 Method	C_r	Swell Press. (ksf)	Swell %
B	0.01		

Project No. 161110426 **Client:** University of South Carolina

Project: Darla Moore School of Business

Location: B-12 / UD-3 / 48-50 ft

Remarks:

"Final density" is at final seat load. S.G. value is assumed.

Checked By: NRR, 6/8/11

Title: Lab Dept Manager

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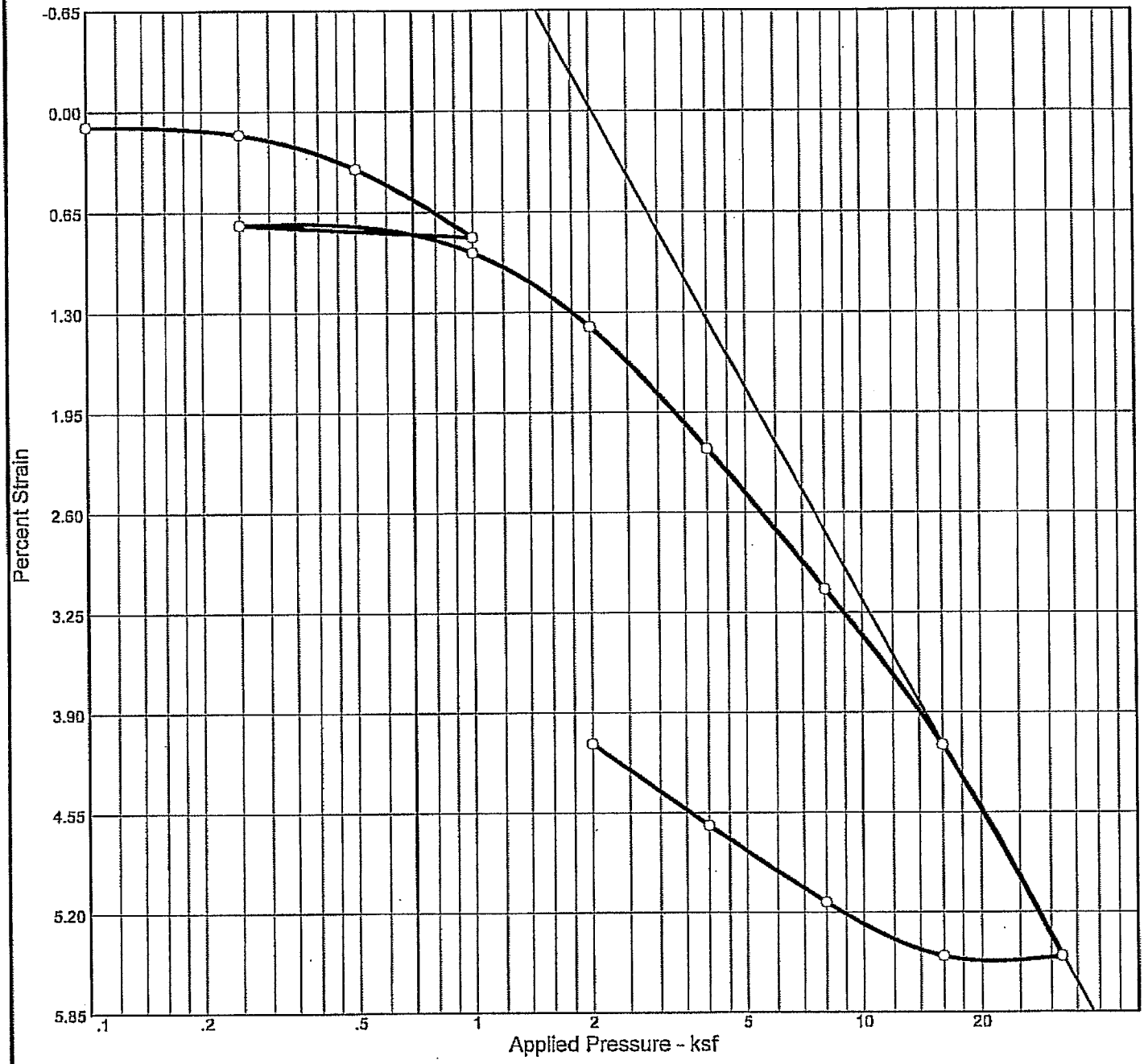
Louisville, TN

CONSOLIDATION TEST REPORT



Natural		Dry Dens. (pcf)	LL	PI	Sp. Gr.	Overburden (ksf)	P_c (ksf)	C_c	C_r	Initial Void Ratio
Saturation	Moisture									
109.2 %	17.5 %	116.5	ND	ND	2.657		3.51	0.07	0.00	0.427

MATERIAL DESCRIPTION	USCS	AASHTO
Mottled Gray Orange Red Fine Sandy Clayey Silt		

Project No. 1611-10-426 **Client:** University of South Carolina

Project: Darla Moore School of Business

Source: **Sample No.:** B-13 UD-1 **Elev./Depth:** 28-30'

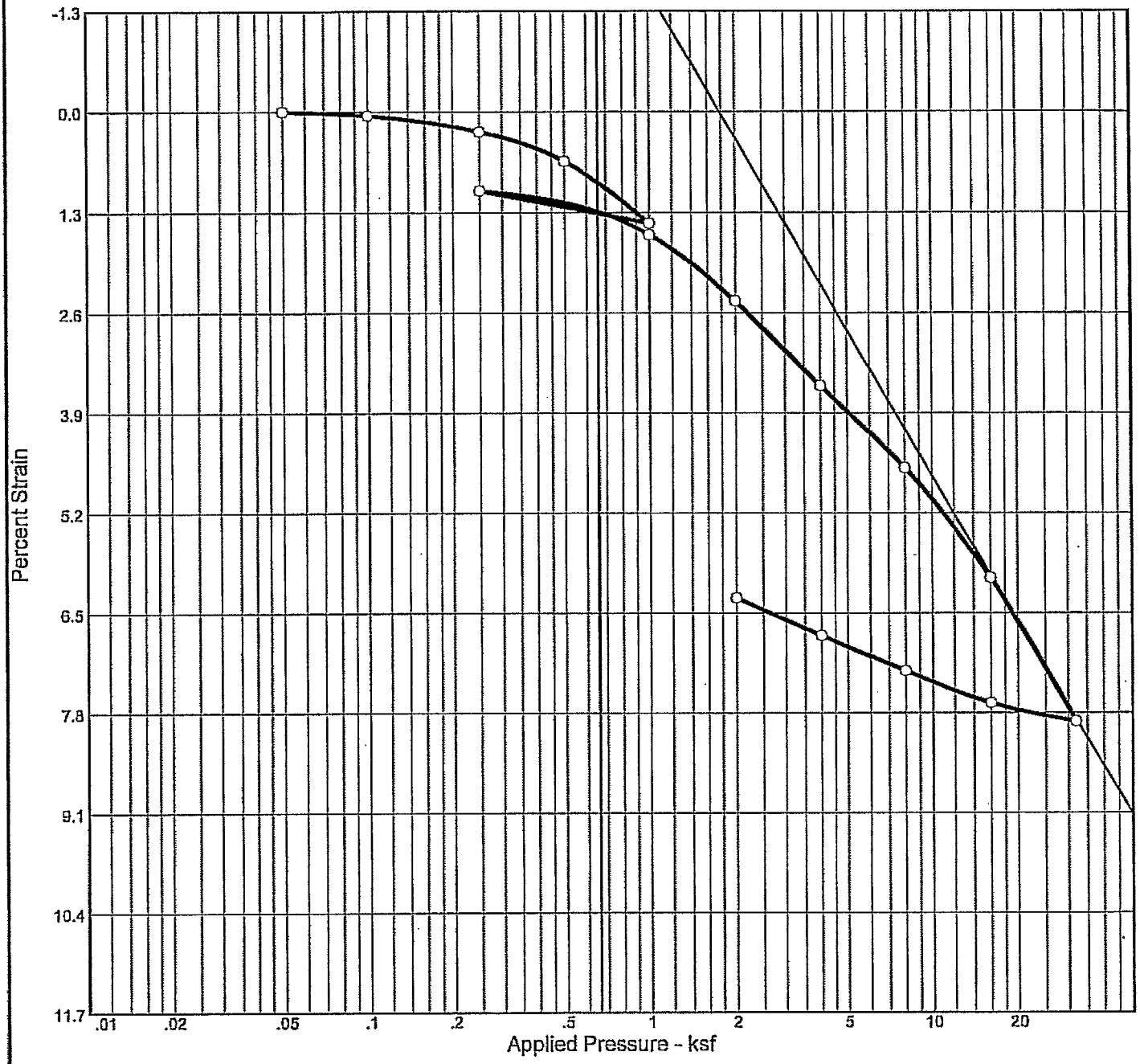
Remarks:
Saturated

S & ME, INC.

Charlotte, North Carolina

Plate B-13 UD1

CONSOLIDATION TEST REPORT



Natural		Dry Dens. (pcf)	LL	PI	Sp. Gr.	Overburden (ksf)	P_c (ksf)	C_c	C_r	Initial Void Ratio
Saturation	Moisture									
134.2 %	25.0 %	103.7	ND	ND	2.624		3.49	0.09	0.01	0.489

MATERIAL DESCRIPTION	USCS	AASHTO
White Gray Fine Sandy Silt		

Project No. 1611-10-426 **Client:** University of South Carolina

Project: Darla Moore School of Business

Source: **Sample No.:** B-13 UD-2 **Elev./Depth:** 43-45'

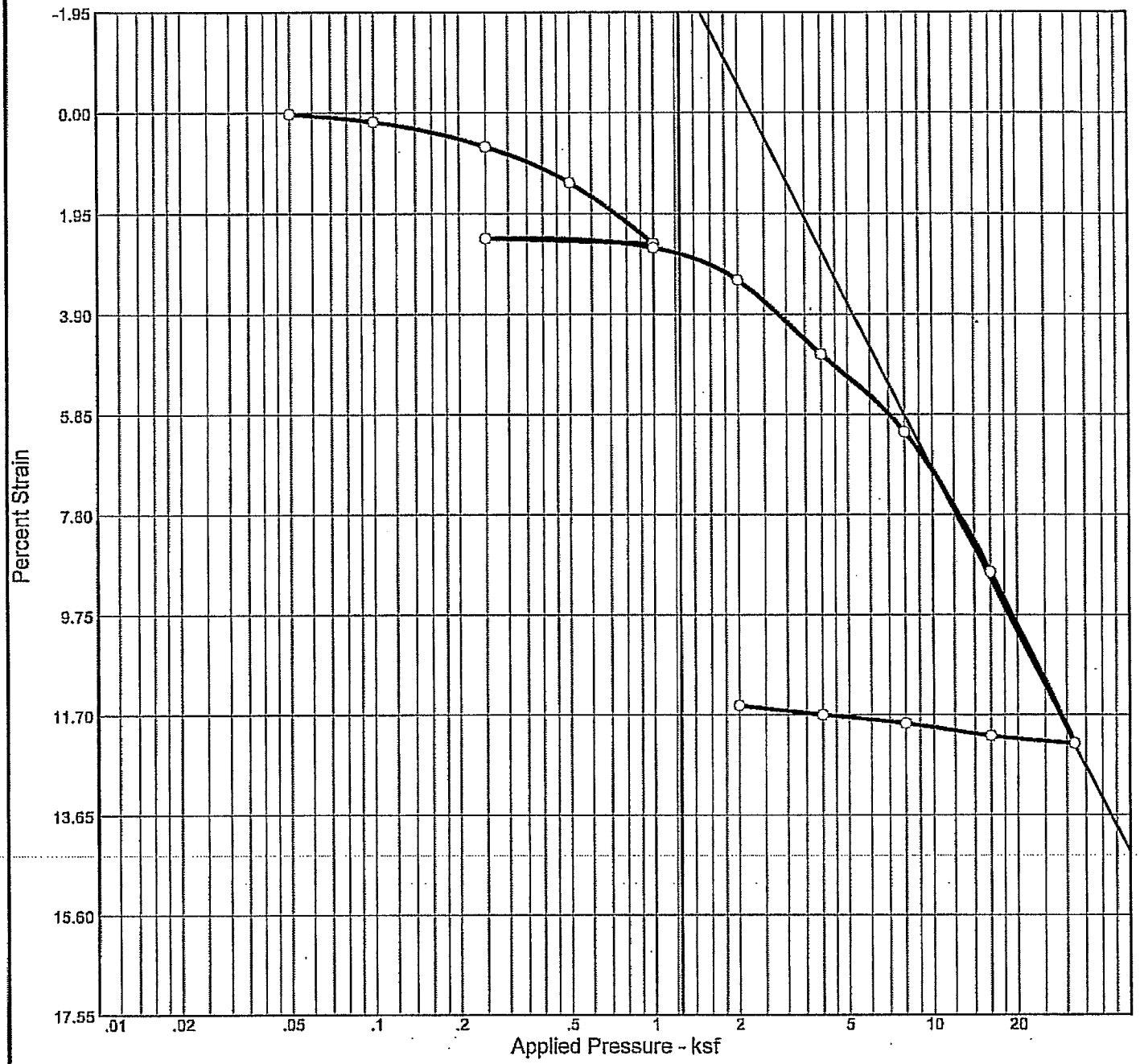
Remarks:
Saturated

S & ME, INC.

Charlotte, North Carolina

Plate B-13 UD2

CONSOLIDATION TEST REPORT



Natural		Dry Dens. (pcf)	LL	PI	Sp. Gr.	Overburden (ksf)	P_c (ksf)	C_c	C_r	Initial Void Ratio
Saturation	Moisture									
28.9 %	7.4 %	102.3	ND	ND	2.632		4.64	0.18	0.00	0.673

MATERIAL DESCRIPTION	USCS	AASHTO
Tan Orange Sl. Clayey Medium to Fine Sand		

Project No. 1611-10-426 **Client:** University of South Carolina

Project: Darla Moore School of Business

Source: **Sample No.:** B-14 UD-1 **Elev./Depth:** 13-15'

Remarks:
Unsaturated

S & ME, INC.

Charlotte, North Carolina

Plate B-14 UD1

Form No. TR-D698-2
Revision No. : 0
Revision Date: 11/21/07

Moisture - Density Report

S&ME

Quality Assurance

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

S&ME Project #:	**1611-10-426**	Report Date:	Apr.12, 2011
Project Name:	Darla Moore School of Business	Test Date(s):	Apr.12, 2011
Client Name:	University of South Carolina, Campus and Construction		
Client Address:	743 Greene Street, Columbia, South Carolina 29208		

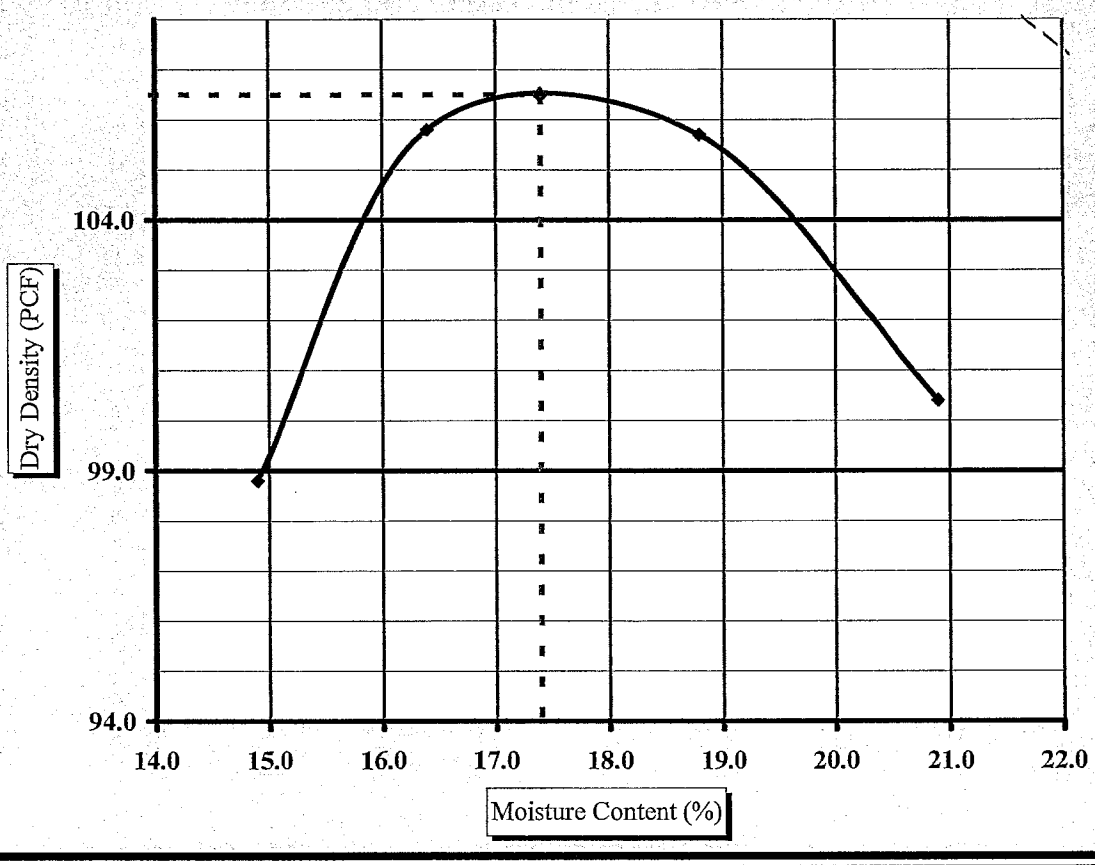
Proctor #:	2	Sample #:	Bulk 2	Sample Date:	Apr.8, 2011
Location:	Greene Street, G-1			Depth:	1.0'-2.5'

Sample Description: Clayey Sand (SC) medium plasticity, fine to medium sand, brownish-red

Maximum Dry Density 106.5 PCF. **Optimum Moisture Content 17.4%**

ASTM D 698 -- Method A

Moisture-Density Relations of Soil and Soil-Aggregate Mixtures



Soil Properties

Natural Moisture Content
Specific Gravity of Soil (D854)
Liquid Limit
Plastic Limit
Plastic Index

% Passing

Oversize Fraction

Bulk Gravity
% Moisture
% Oversize
MDD
Opt. MC

Moisture-Density Curve Displayed: Fine Fraction ☒ Corrected for Oversize Fraction (ASTM D 4718) ☐

Sieve Size used to separate the Oversize Fraction: #4 Sieve ☒ 3/8 inch Sieve ☐ 3/4 inch Sieve ☐

Mechanical Rammer ☒ Manual Rammer ☐ Moist Preparation ☐ Dry Preparation ☒

References / Comments / Deviations: ASTM D 854: Specific Gravity of Soils

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

Matt Glunt, P.E.		Staff Professional	Apr.12, 2011
Technical Responsibility	*Signature*	*Position*	*Date*

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Form No. TR-D1883-T193-3
Revision No. 1
Revision Date: 9/29/08

CBR (California Bearing Ratio) of Laboratory Compacted Soil

ASTM D 1883

S&ME

Quality Assurance

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

Project #:	**1611-10-426**	Report Date:	Apr.15, 2011
Project Name:	Darla Moore School of Business	Test Date(s)	Apr.11, 2011
Client Name:	University of South Carolina, Campus and Construction		
Client Address:	743 Greene Street, Columbia, South Carolina 29208		

Boring #: G-1 Sample #: Bulk 2 Sample Date: Apr.8, 2011

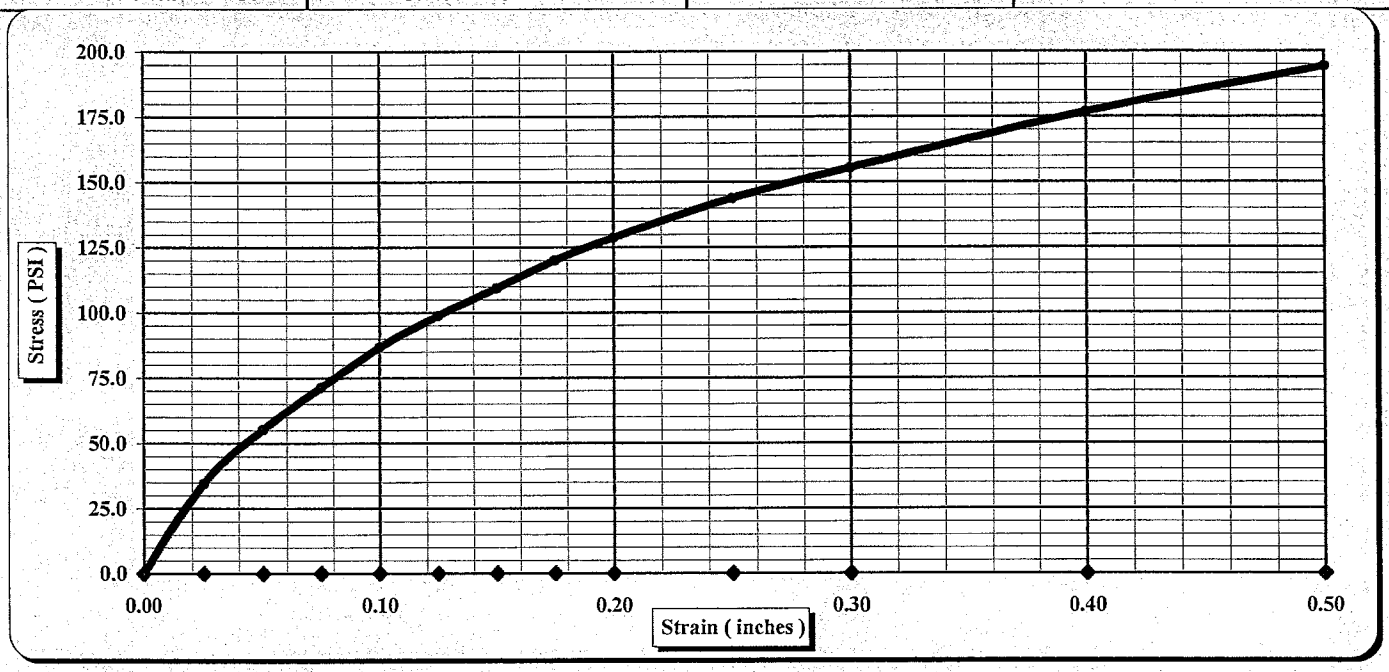
Location: G-1 Elevation: 1.0'-2.5'

Sample Description: Clayey Sand (SC), medium plasticity, fine to medium sand, brownish-red 98% Comp.

ASTM D 698 *Method A* Maximum Dry Density: **106.5 PCF** Optimum Moisture Content: **17.4%**

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. 8.7	**CBR at 0.2 in. 8.6**	**CBR at 0.1 in. 0.0**	**CBR at 0.2 in. 0.0**



CBR Sample Preparation: *Performed on the fine fraction*

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)	42	Final Dry Density (PCF)	99.9
Initial Dry Density (PCF)	114.6	Average Final Moisture Content	22.0%
Moisture Content of the Compacted Specimen	17.5%	Moisture Content (top 1" after soaking)	22.0%
Percent Compaction	97.4%	Percent Swell	0.1%

Soak Time: 96 Hours Surcharge Weight 10.0 Surcharge Wt. per sq. Ft. 51.0

Liquid Limit NP Plastic Index NP Apparent Relative Density

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

Brian Urban	4/15/2011	Matt Glunt, P.E.	4/15/2011
Technical Responsibility	*Signature*	*Position*	*Date*

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Form No. TR-D698-2
Revision No. : 0
Revision Date: 11/21/07

Moisture - Density Report

S&ME

Quality Assurance

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

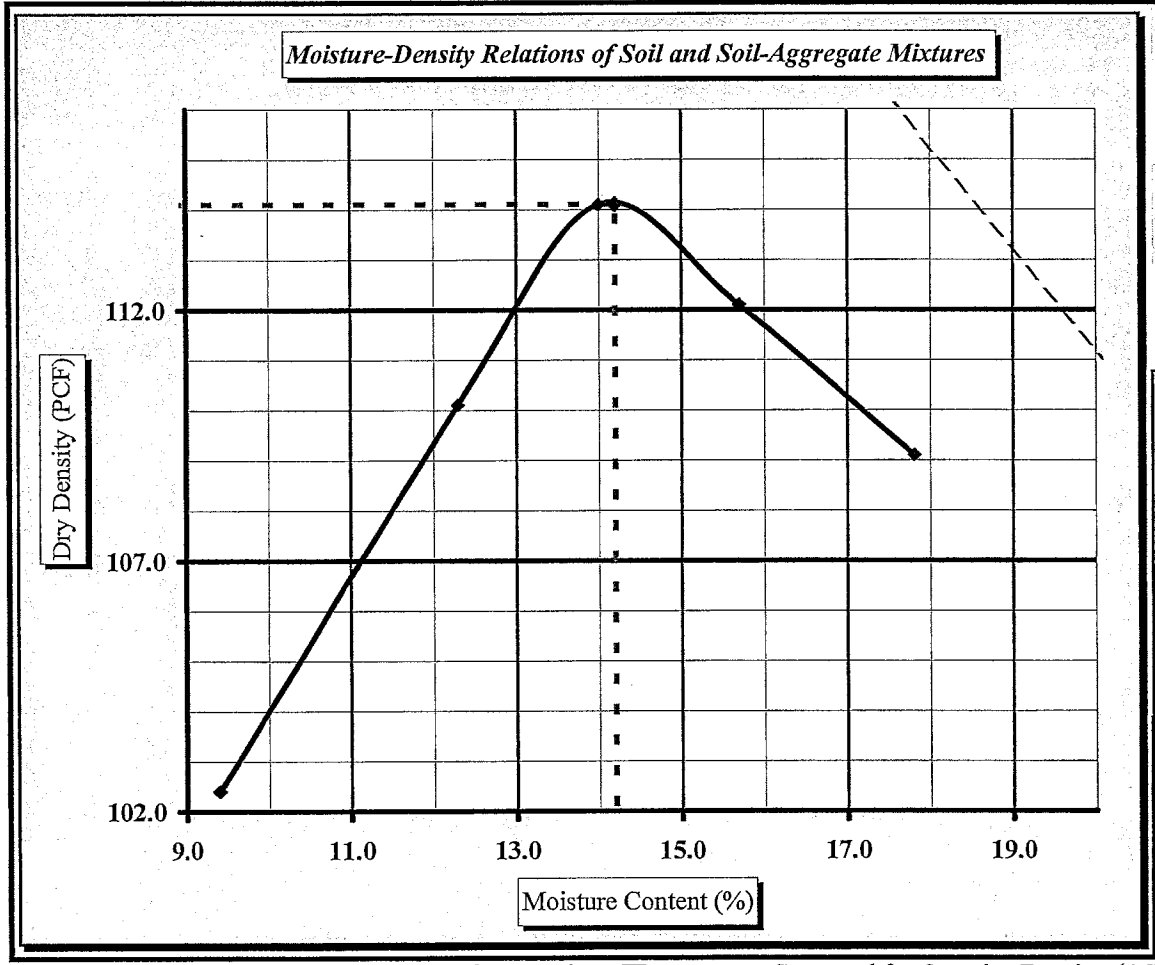
S&ME Project #:	**1611-10-426**	Report Date:	Apr.12, 2011
Project Name:	Darla Moore School of Business	Test Date(s):	Apr.12, 2011
Client Name:	University of South Carolina, Campus and Construction		
Client Address:	743 Greene Street, Columbia, South Carolina 29208		

Proctor #:	1	Sample #:	Bulk 1	Sample Date:	Apr.8, 2011
Location:	Park Street, P-1			Depth:	1.0'-2.5'

Sample Description: Clayey Sand (SC) low plasticity, fine to medium sand, brownish-red

Maximum Dry Density 114.1 PCF. **Optimum Moisture Content 14.2%**

ASTM D 698 -- Method A



Soil Properties

Natural Moisture Content
Specific Gravity of Soil (D854)
Liquid Limit
Plastic Limit
Plastic Index

% Passing

Oversize Fraction

Bulk Gravity
% Moisture
% Oversize
MDD
Opt. MC

Moisture-Density Curve Displayed: Fine Fraction ☒ Corrected for Oversize Fraction (ASTM D 4718) ☐

Sieve Size used to separate the Oversize Fraction: #4 Sieve ☒ 3/8 inch Sieve ☐ 3/4 inch Sieve ☐

Mechanical Rammer ☒ Manual Rammer ☐ Moist Preparation ☐ Dry Preparation ☒

References / Comments / Deviations: ASTM D 854: Specific Gravity of Soils

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

Matt Glunt, P.E.		Staff Professional	Apr.12, 2011
Technical Responsibility	*Signature*	*Position*	*Date*

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Form No. TR-D1883-T193-3
Revision No. 1
Revision Date: 9/29/08

CBR (California Bearing Ratio) of Laboratory Compacted Soil

ASTM D 1883

S&ME

Quality Assurance

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

Project #:	**1611-10-426**	Report Date:	Apr.15, 2011
Project Name:	Darla Moore School of Business	Test Date(s)	Apr.11, 2011
Client Name:	University of South Carolina, Campus and Construction		
Client Address:	743 Greene Street, Columbia, South Carolina 29208		

Boring #: P-1 Sample #: Bulk 1 Sample Date: Apr.8, 2011

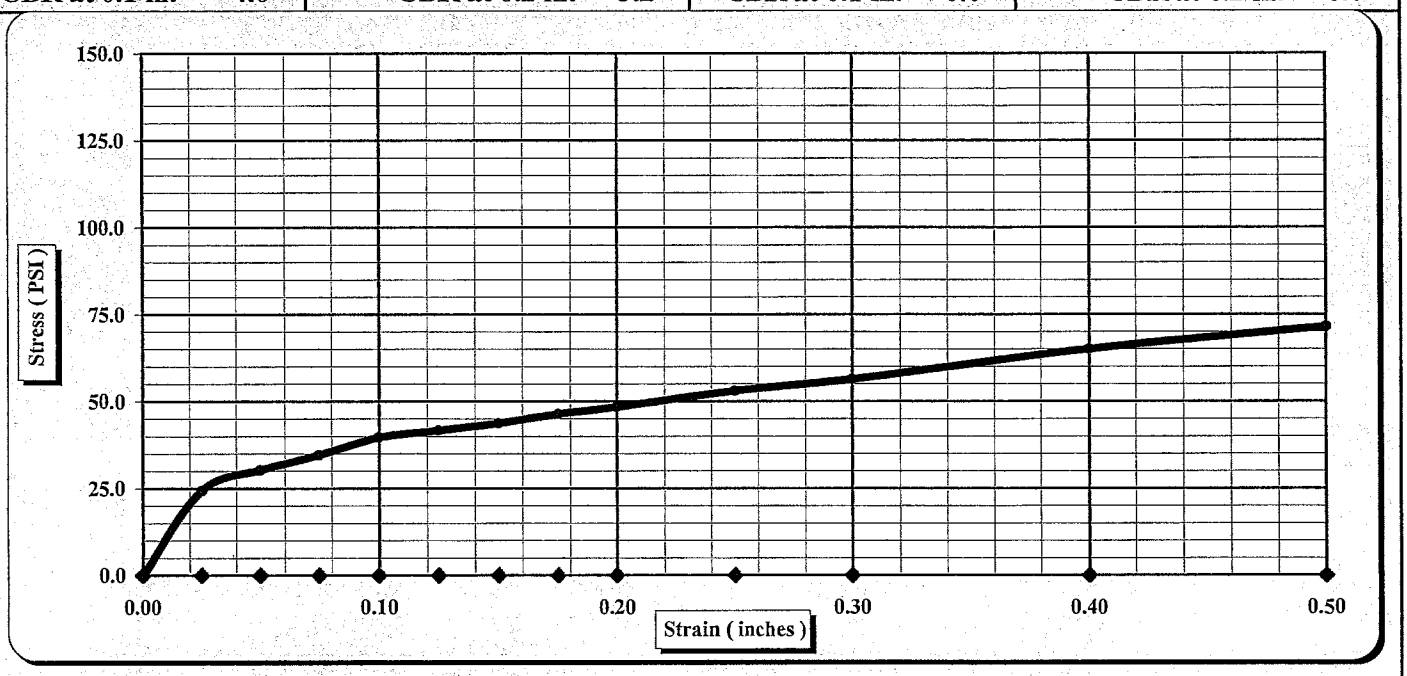
Location: P-1 Elevation: 1.0'-2.5'

Sample Description: Clayey Sand (SC) low plasticity, fine to medium sand, brownish-red 98% Comp.

ASTM D 698 ***Method A*** Maximum Dry Density: **114.1 PCF** Optimum Moisture Content: **14.2%**

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. 4.0	**CBR at 0.2 in. 3.2**	**CBR at 0.1 in. 0.0**	**CBR at 0.2 in. 0.0**



CBR Sample Preparation: *Performed on the fine fraction*

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)	38	Final Dry Density (PCF)	109.1
Initial Dry Density (PCF)	114.6	Average Final Moisture Content	15.3%
Moisture Content of the Compacted Specimen	14.1%	Moisture Content (top 1" after soaking)	15.3%
Percent Compaction	96.9%	Percent Swell	0.3%

Soak Time: 96 Hours Surcharge Weight 10.0 Surcharge Wt. per sq. Ft. 51.0

Liquid Limit NP Plastic Index NP Apparent Relative Density

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

Brian Urban	4/15/2011	Matt Glunt, P.E.	4/15/2011
Technical Responsibility	*Signature*	*Position*	*Date*

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TECHNICAL SPECIFICATIONS

DIVISION 02 – EXISTING CONDITIONS

SECTION 02 37 00 – SEDIMENTATION AND EROSION CONTROL

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. The extent of soil erosion and sedimentation control work is shown on the Drawings and by the requirements of this section.

B. Soil erosion and sedimentation control measures shall include all temporary and permanent means of protection and trapping soils on the construction site during land disturbing activities to include.

1. Construction of temporary site gravel construction entrance
2. Installation, and subsequent removal, of temporary perimeter silt fencing.
3. Removal of temporary inlet protection.
4. Temporary Grassing of disturbed areas.

1.3 REFERENCES

A. South Carolina Stormwater Management and Sedimentation Control Handbook for Land Disturbance Activities, by SCDHEC.

B. South Carolina Department of Highways and Public Transportation, "Standard Specifications for Highway Construction", latest Edition, hereinafter referred to as SCDOT Specifications.

1.4 SUBMITTALS

A. Product Data: Provide manufacture's technical product data and installation instructions for soil erosion and sedimentation control materials and products.

B. Schedule of Operations: Submit schedule of proposed operations, including program for erosion control measures, maintenance of control facilities, and vegetative practices. Show anticipated starting and completion dates for land-disturbing activities, including excavation, filling and rough grading, finish grading, construction of temporary and permanent erosion control measures, and disposition of temporary erosion control measures.

C. Contractor shall sign "Co-Permittee Agreement" and return to Architect/Engineer before beginning any construction activities.

1.5 PROJECT CONDITIONS

A. Prior to extensive use of the site, the Contractor shall construct the site gravel construction entrance. The intent of the site gravel construction entrance is to provide for minimal transportation of sediments into the public right-of-way.

B. Construct and maintain temporary erosion control measures until such time as permanent paving, plantings, and grassing of landscape areas is effective in controlling erosion/sediment from the site. Extent of sedimentation/erosion control construction shall be the responsibility of the Contractor, based on actual site conditions at the project.

C. Protect adjacent and downstream properties from siltification resulting from erosion of project graded areas.

D. The Contractor shall comply with all requirements of the approved permits from City of Columbia, SCDHEC and SCDOT.

PART 2 - PRODUCTS

2.1 SILT FENCING

A. General: Provide silt fence specifically manufactured for the application intended and as follows:

B. Silt Fence Fabric:

1. Available manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work includes but are not limited to the following:

   a. AMOCO Fabrics and Fibers Co.
   b. Mirafi Inc.
   c. Nicolon Corp.
   d. TNS Advanced Technologies, Inc.

2. Characteristics:

   a. Type: Woven, polypropylene, geotextile fabric; 30-inch minimum width.
   b. Apparent Opening Size (AOS): #20 to #40 U.S. Standard Sieve; ASTM D4751.
   c. Grab Tensile Strength: Minimum 110 lbs.; ASTM D4632.
   d. Grab Elongation: Maximum 30%; ASTM D4632.
   e. Bursting Strength: Minimum 275 psi; ASTM D3786.
   f. Filter Efficiency: Minimum 85%.
   g. Slurry Flow Rate: Maximum 0.3 gpm/sf; ASTM D4491.
   h. Permeability: Maximum 20 gpm/sf; ASTM D4491.

C. Wire Fabric:

1. Support standard strength silt fence fabric with wire fence of the following properties:

   a. Wires: Minimum 14 gauge.
   b. Mesh Spacing: Maximum 6-inches.

D. Posts: Either 1.33-lbs/lf steel, minimum 4-feet in length. Make sure that steel posts have projections to facilitate fastening of the fabric.

1. Space posts for silt fence fabric with wire mesh support at a maximum of 8-feet apart. Support posts should be driven securely into the ground to a minimum of 18-inches.
2. Space posts for silt fence fabric without wire mesh support to a maximum of 6-feet apart. Support posts should be driven securely into the ground to a minimum of 18-inches.

2.2 OTHER MATERIALS

A. Stone Rip-Rap: Crushed Stone with weight gradation of 20 to 200 lbs. per piece and a median diameter of 8-inches. Meet SCDOT Specifications.

B. Filter Stone: Stone size in accordance with ASTM D448 size No. 1 {1-1/2 to 3-1/2 inch diameter}. Meet SCDOT Specifications.

C. Gravel: #57 Stone per SCDOT Specifications.

D. Filter Fabric: Conform to ASTM E1682 & E1683.

2.3 TEMPORARY GRASSING MATERIALS

A. Grass Seed:

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 the year grown, percentage of purity, percentage of germination, and the date of the test by which the percentages of purity and germination were determined. All seed sown shall have a date of test within six months of the date of sowing.

B. Fertilizer:

1. Regular Type:

   a. Nitrogen content derived from organic or inorganic sources, bearing manufacturer's statement of analysis.
   b. Minimum requirements: 12%-nitrogen, 4%-phosphoric acid, and 8%-potash.

2. Slow Release Type:

   a. 50% of nitrogen content to be slow-release form, content derived from organic or inorganic sources, bearing manufacturer's statement of analysis.
   b. Minimum requirements: 10%-nitrogen, 10%-phosphoric acid, and 10%-potash.

3. Commercial Mixed Type:

   a. Nitrogen content derived from organic or inorganic sources, bearing manufacturer's statement of analysis.
   b. Minimum requirements: 10%-nitrogen, 10%-phophoric acid, and 10%-potash.

C. Mulch: Clean, seed-free straw of hay, wheat, rye, oats or barley.

D. Hydromulch: Wood cellulose fiber containing no germination-inhibiting or growth-inhibiting agents. Characteristics shall be as follows:

1. Percent Moisture Content: 9.0% ($\pm$3.0%).
2. Percent Organic Matter: 99.2% ($\pm$0.8%).
3. Percent Ash Content: 0.8% ($\pm$0.2%).
4. pH: 4.8 ($\pm$0.5).
5. Water holding capacity: Minimum 40-oz. water/3.5-oz. fiber.

E. Hydraulically Applied Growth Medium:

1. Minimum Mass / Unit Area: 12 oz/yd^2 (ASTM D6566).
2. Minimum Thickness: 0.22 in (ASTM D6525).
3. Minimum Wet Bond Strength: 9 lb/ft (ASTM D6818).
4. Minimum Ground Cover: 99% (ASTM D6567).
5. Minimum Water-Holding Capacity: 1700% (ASTM D7367).
6. Material Color: Green.
7. Biodegradability: 100% (ASTM D5338).
8. Functional Longevity: Approximately 18 months (ASTM D5338).
9. Vegetation Establishment: >800% (ASTM D7322).

F. Seeding Recommendations:

1. For Late Winter and Early Spring Seeding:

   a. Seeding mixture: Rye (grain) seed at 220-lbs./acre and Unhulled Bermuda seed at 80-lbs/acre.

      1) Omit Bermuda seed when duration of temporary cover is not to extend beyond June.

   b. Soil Amendments: Follow recommendations of soil tests or apply 2,000-lbs/acre ground agricultural limestone and 750-lbs/acre 10-10-10 fertilizer.
   c. Mulch: Apply 4,000-lbs/acre of straw. Anchor straw by tacking with asphalt, netting or a mulch-anchoring tool. A disk with blades set nearly straight can be used as a mulch-anchoring tool.
   d. Maintenance: Re-fertilize if growth is not fully adequate. Re-seed, re-fertilize, and mulch immediately following erosion or other damage.

2. For Summer Seeding:

   a. Seeding mixture: Hulled Bermuda seed at 80-lbs./acre.
   b. Soil Amendments: Follow recommendations of soil tests or apply 2,000-lbs/acre ground agricultural limestone and 750-lbs/acre 10-10-10 fertilizer.
   c. Mulch: Apply 4,000-lbs/acre of straw. Anchor straw by tacking with asphalt, netting or a mulch-anchoring tool. A disk with blades set nearly straight can be used as a mulch-anchoring tool.
   d. Maintenance: Re-fertilize if growth is not fully adequate. Re-seed, re-fertilize, and mulch immediately following erosion or other damage.

3. For Fall Seeding;

a. Seeding mixture: Rye (grain) seed at 220-lbs/acre.
b. Soil Amendments: Follow recommendations of soil tests or apply 2,000-lbs/acre ground agricultural limestone and 1,000-lbs/acre 10-10-10 fertilizer.
c. Mulch: Apply 4,000-lbs/acre of straw. Anchor straw by tacking with asphalt, netting or a mulch-anchoring tool. A disk with blades set nearly straight can be used as a mulch-anchoring tool.
d. Maintenance: Re-fertilize if growth is not fully adequate. Re-seed, re-fertilize, and mulch immediately following erosion or other damage. Top-dress with 50-lbs/acre of nitrogen in March. If it is necessary to extend temporary coverage beyond June 15, overseed with 80-lbs/acre of Unhulled Bermuda seed in late February or early March.

PART 3 - EXECUTION

3.1 GENERAL

A. All disturbed soil areas, except those to support structures, shall be graded and protected from erosion by grassing or other protection measures. Stormwater conveyance systems shall have sediment barriers installed at all entrances, intersections, changes in direction, discharge points, and other locations as indicated on the drawings.

B. Schedule grading operations to minimize exposure of graded surfaces prior to installation of permanent construction.

C. Maintain large graded areas as flat as possible to minimize runoff.

3.2 SEQUENCE OF WORK

A. The Contractor shall coordinate work with the Construction Manager and shall follow phasing instructions per the Construction Manager.

B. The intent of the Work of this Section is to provide for the orderly installation of preventative measures to control the migration of sediments and the damage caused by erosion from stormwater events. The Contractor shall be cognizant of the goals to be achieved and shall organize his work to effectively accomplish the goals. Whenever specified measures, properly constructed and maintained, are not providing the degree of control of sediments and erosion that is deemed satisfactory, the Contractor shall notify the Architect/Engineer and shall propose any additional measures which may be justified.

C. Inspect all sediment and erosion control devices at least weekly and after each rain event. Repair any damaged portions immediately. All inspections shall be recorded in the Stormwater Pollution Prevention binder and kept on-site.

3.3 INSTALLATION OF TEMPORARY GRASSING

A. Verify soil surface is ready to receive temporary grassing. A good seedbed is well-pulverized, loose, and uniform. Where hydro-seeding methods are used, the surface may be left with a more irregular surface or large clods and stones.

B. Apply Temporary Seeding per seeding recommendations listed for the appropriate time of year.

1. Liming: Apply lime according to soil test recommendations. If the pH (acidity) of the soil is not known, an application of ground agricultural limestone at the rate of 1 to 1-1/2 tons/acre on coarse-textures soils and 2 to 3 tons/acre on fine-textured soils is usually sufficient. Apply limestone uniformly and incorporate into the top 4 to 6-inches of soil. Soils with a pH of 6 or higher do not need lime additive.
2. Fertilizer: Base applications rates on soil tests. When these are not possible, apply a 10-10-10 grade fertilizer at 700 to 1,000 lbs/acre. Both fertilizer and lime should be incorporated into the top 4 to 6-inches of soil. If a hydraulic seeder is used, do not mix seed and fertilizer more than 30-minutes before application.
3. Surface Roughening: If recent tillage operations have resulted in a loose surface condition, additional roughening may not be required except to break up large clods. If rainfall causes the surface to become sealed or crusted, loosen soil just prior to seeding by disking, raking, harrowing, or other suitable methods. Groove or furrow slopes steeper than 3-horizontal to 1-vertical (3:1) on the contour before seeding.
4. Evenly apply seed using a cyclone seeder (broadcast), drill, cultipacker seeder, or hydro-seeder. Use seeding rates per recommendations given previously in this section. Broadcast seeding and hydro-seeding are appropriate for sleep slopes where equipment cannot be driven. Hand broadcasting is not recommended because of the difficulty of achieving uniform distribution.

    a. Small grains should be planted not more than 1-inch deep, and grasses and legumes not more than 1/2-inch deep. Broadcast seed must be covered by raking or chain dragging, and then lightly firmed with a roller or cultipacker. Hydro-seeded mixtures should include wood-fiber (cellulose) mulch.

5. Mulching: The use of an appropriate mulch will help ensure grass establishment under normal conditions and is essential to seeding success under harsh site conditions. Harsh site conditions include:

    a. Seeding in fall for winter cover (wood-fiber mulches are not considered adequate for this use).
    b. Slopes steeper than 3:1.
    c. Excessively hot or dry weather.
    d. Adverse soils (shallow, rocky, or high in clay or sand content).
    e. Areas receiving concentrated flow.

6. If the area to be mulched is subject to concentrated water flow, as in a channel, anchor mulch with netting.
7. Maintenance: Reseed and mulch areas where seedling emergence is poor, or where erosion occurs, as soon as possible. Do not mow. Protect from traffic as much as possible.

3.4 INSTALLATION OF SEDIMENT BARRIERS

A. Silt Fencing for Sheet Flow Applications:

1. Install the silt fencing in the locations indicated on the Drawings. Adjust fencing as directed by the Architect/Engineer to allow for proper functioning.

2. Silt fencing sections shall be installed along a constant contour elevation as much as practical. Avoid concentration of flows through fencing caused by installation at varying elevations.
3. Follow the manufacturer's instructions for proper installation procedures of overlapping sections, as well as depth of bury for posts.
4. Install per the following general directions:

    a. Excavate a 6-inch deep, 8-inch wide trench on the upstream side of the desired fence line location along the entire length of the proposed barrier.
    b. Unroll the silt fence fabric material (or pre-assembled assembly) and attach to posts, position the posts behind the trench (downhill side), and hammer the posts at least 18-inches in the ground.
    c. Ensure that the height of the silt fence does not exceed 36-inches above the ground surface. (Higher fences may impound volumes of water sufficient to cause failure of the structure.)
    d. Lay a minimum 6-inches of the bottom portion of the silt fencing fabric into the bottom of the trench to prevent undermining by stormwater runoff.
    e. Backfill the trench with stone and compact. Compaction is necessary to prevent runoff from eroding the backfill.
    f. Inspect and repair or replace damaged silt fencing promptly. Remove silt fencing when the uphill sloped areas have been permanently stabilized.

B. Gravel Check Dams for Channel Flow Applications:

1. Install gravel check dams per the Construction Details on the Drawings and as follows:

    a. Place the stone to the lines and dimensions shown in the Drawings, on a filter fabric foundation.
    b. Keep the center stone section at least 9-inches below natural grade level where the dam abuts the channel banks.
    c. Extend stone at least 1-1/2 feet beyond the ditch banks to keep overflow water from undercutting the dam as it re-enters the channel.
    d. Set spacing for the dam to assure that the elevation at the top of the lower dam is the same as the toe elevation of the upper dam.
    e. Protect the channel downstream from the lowest check dam, considering that water will flow over and around the dam.
    f. Make sure that the channel reach above the most upstream check dam is stable.
    g. Ensure that channel appurtenances, such as culvert entrances below check dams, are not subject to damage or blocking from displaced stones.
    h. Inspect check dams and channels for damage after each rain event.
    i. Anticipate submergence and deposition above the check dam and erosion from high flows around the edges of the check dam. Correct all damage immediately. If significant erosion occurs between check dams, install a protective rip-rap liner in that portion of the channel.
    j. Remove sediment accumulated behind check dams as needed to prevent damage to channel vegetation, allow the channel to drain through the check dam, and prevent large flows from carrying sediment over the check dam. Add stone to dams as needed to maintain design height and cross section.

C. Silt Fence Inlet Sediment Barriers:

1. Install per the Construction Details on the Drawings.

3.5 STORM DRAINAGE SYSTEM

A. Construct storm drainage system as expediently as possible as a permanent erosion control measure. Surface water may be directed into complete portions of drainage system as soon as practicable.

B. Maintain temporary sediment barriers around drainage structures until all areas draining to structure have been permanently stabilized, to prevent washing of sediment into storm drainage system or off site.

C. Flush drainage lines between drainage structures as required during construction and after establishment of permanent erosion control measures to remove collected debris.

3.6 GROUND COVER

A. Protect exposed soils having a slope of 3:1 or greater with ground cover, except as otherwise specified herein.

B. Ground cover may consist of any effective erosion prevention treatment such as straw mulch, stone base, plastic sheeting, hydro-seeding, or installation of temporary or permanent grassing or plantings, as applicable.

C. All grassing and planting operations shall include mulching as stabilization until ground cover planting is effective.

3.7 REMOVAL OF TEMPORARY EROSION CONTROL DEVICES

A. As soon as permanent erosion control devices are established, and SCDHEC approval has been received, the Contractor may remove temporary devices, including, sediment barriers and other devices. This includes redistributing collected amounts of silt over the project site.

B. Remove all debris resulting from temporary erosion from the project site.

C. Check and clean adjacent existing drainage structures of material introduced during construction.

3.8 POLLUTION PREVENTION

A. The Contractor shall conduct all operations and shall instruct his Sub-Contractors, if any, to conduct their operations in a safe and pollution free manner.

B. The Contractor shall establish dedicated areas for the parking and servicing of all vehicles. Any petroleum products that are deposited on the ground, for any reason, shall be promptly excavated along with any contaminated soils and disposed of at a permitted disposal site.

C. No containers, bags, cans, rubbish, litter or other debris of any sort will be allowed to remain on the site. Any debris resulting from the Contractor's operations, shall be removed daily and disposed of off-site.

END OF SECTION 02 37 00

SECTION 02 41 19 - SELECTIVE STRUCTURE DEMOLITION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Demolition and removal of selected portions of building or structure.
2. Demolition and removal of selected site elements.
3. Salvage of existing items to be reused or recycled.

B. Related Requirements:

1. Section 311000 "Site Clearing" for site clearing and removal of above- and below-grade improvements.

1.3 DEFINITIONS

A. Remove: Detach items from existing construction and legally dispose of them off-site unless indicated to be removed and salvaged or removed and reinstalled.

B. Remove and Salvage: Carefully detach from existing construction, in a manner to prevent damage, and deliver to Owner.

C. Remove and Reinstall: Detach items from existing construction, prepare for reuse, and reinstall where indicated.

D. Existing to Remain: Existing items of construction that are not to be permanently removed and that are not otherwise indicated to be removed, removed and salvaged, or removed and reinstalled.

1.4 MATERIALS OWNERSHIP

A. Unless otherwise indicated, demolition waste becomes property of Contractor.

B. Historic items, relics, antiques, and similar objects including, but not limited to, cornerstones and their contents, commemorative plaques and tablets, and other items of interest or value to Owner that may be uncovered during demolition remain the property of Owner.

1. Carefully salvage in a manner to prevent damage and promptly return to Owner.

1.5 FIELD CONDITIONS

A. Owner will occupy portions of building immediately adjacent to selective demolition area. Conduct selective demolition so Owner's operations will not be disrupted.

B. Conditions existing at time of inspection for bidding purpose will be maintained by Owner as far as practical.

C. Notify Architect of discrepancies between existing conditions and Drawings before proceeding with selective demolition.

D. Hazardous Materials: It is not expected that hazardous materials will be encountered in the Work.

E. Storage or sale of removed items or materials on-site is not permitted.

F. Utility Service: Maintain existing utilities indicated to remain in service and protect them against damage during selective demolition operations.

PART 2 - PRODUCTS

2.1 PEFORMANCE REQUIREMENTS

A. Regulatory Requirements: Comply with governing EPA notification regulations before beginning selective demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.

B. Standards: Comply with ANSI/ASSE A10.6 and NFPA 241.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that utilities have been disconnected and capped before starting selective demolition operations.

B. Review record documents of existing construction provided by Owner. Owner does not guarantee that existing conditions are same as those indicated in record documents.

C. Survey existing conditions and correlate with requirements indicated to determine extent of selective demolition required.

D. When unanticipated mechanical, electrical, or structural elements that conflict with intended function or design are encountered, investigate and measure the nature and extent of conflict. Promptly submit a written report to Architect.

3.2 PREPARATION

A. Site Access and Temporary Controls: Conduct selective demolition and debris-removal operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.

1. Comply with requirements for access and protection specified in Section 015000 "Temporary Facilities and Controls."

B. Temporary Facilities: Provide temporary barricades and other protection required to prevent injury to people and damage to adjacent buildings and facilities to remain.

1. Provide protection to ensure safe passage of people around selective demolition area and to and from occupied portions of building.

3.3 SELECTIVE DEMOLITION PROCEDURES FOR SPECIFIC MATERIALS

A. Concrete: Demolish in small sections. Using power-driven saw, cut concrete to a depth of at least 3/4 inch (19 mm) at junctures with construction to remain. Dislodge concrete from reinforcement at perimeter of areas being demolished, cut reinforcement, and then remove remainder of concrete. Neatly trim openings to dimensions indicated.

B. Concrete: Demolish in sections. Cut concrete full depth at junctures with construction to remain and at regular intervals using power-driven saw, then remove concrete between saw cuts.

C. Masonry: Demolish in small sections. Cut masonry at junctures with construction to remain, using power-driven saw, then remove masonry between saw cuts.

D. Concrete Slabs-on-Grade: Saw-cut perimeter of area to be demolished, then break up and remove.

3.4 DISPOSAL OF DEMOLISHED MATERIALS

A. General: Except for items or materials indicated to be recycled, reused, salvaged, reinstalled, or otherwise indicated to remain Owner's property, remove demolished materials from Project site and legally dispose of them in an EPA-approved landfill.

1. Do not allow demolished materials to accumulate on-site.
2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.

B. Burning: Do not burn demolished materials.

C. Disposal: Transport demolished materials off Owner's property and legally dispose of them.

END OF SECTION 02 41 19

SECTION 02 72 10 – AGGREGATE BASE COURSE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Aggregate Base Course under Slabs-on-Grade.
2. Aggregate Base Course under Sidewalks and Pads.
3. Aggregate Base Course under Roads and Parking Areas.

1.3 LEED BUILDING GENERAL REQUIREMENTS

A. The University of South Carolina requires the Contractor to implement practices and procedures to meet the project's environmental performances goals, which include achieving LEED Certification. Specific project goals that may impact this area of work include: use of recycled-content materials; use of locally-manufactured materials; use of low-emitting materials; construction waste recycling; and the implementation of a construction indoor air quality management plan. The Contractor shall ensure that the requirements related to these goals, as defined in the sections below, are implemented to the fullest extent. Substitutions shall not be allowed if such changes comprise the stated LEED BUILDING Performance Criteria.

1.4 REFERENCES

A. SCDOT – South Carolina State Highway Department Standard Specifications for Highway Construction, 2000 Edition.

B. AASHTO M 147 – Standard Specification for Materials for Aggregate and Soil-Aggregate Subbase, Base and Surface Courses; American Association of State Highway and Transportation Officials; 1965 (1996).

C. AASHTO T 180 – Standard Specification for Moisture-Density Relations of Soils Using a 4.54 kg (10 lbs) Rammer and a 457 mm (18 in.) Drop; American Association of State Highway and Transportation Officials; 1997.

D. ASTM C136 – Standard Test Method for Sieve Analysis of Fine and Course Aggregates; 1996a.

E. ASTM D698 – Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbs/ft3); 1991 (Re-Approved 1998).

F. ASTM D1556 – Standard Test Method for Density and Unit Weight of Soil in-Place by the Sand-Cone Method; 1990 (Re-Approved 1996).

G. ASTM D1557 – Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbs/ft3); 1991 (Re-Approved 1998).

H. ASTM D2167 – Standard Test Method for Density and Unit Weight of Soil in-Place by the Rubber Balloon Method; 1994.

I. ASTM D2487 – Standard Classification of Soils for Engineering Purposes (Unified Soil Classification System); 1998.

J. ASTM D2922 - Standard Test Method for Density and Unit Weight of Soil in-Place by Nuclear Methods (Shallow Depth); 1994.

K. ASTM D3017 – Standard Test Method for Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth); 1996.

L. ASTM D4318 – Standard Test Method for Liquid Limit, Plastic Limit, and Plasticity Index of Soils; 1998.

1.5 DEFINITIONS

A. Base Course: Layer placed between the subbase course and asphalt paving.

B. Drainage Course: Layer supporting slab-on-grade used to minimize capillary flow of pore water.

C. Structures: Buildings, footings, foundations, retaining walls, slabs, tanks, curbs, mechanical and electrical appurtenances, or other man-made stationary features constructed above or below the ground surface.

D. Subbase Course: Layer placed between the subgrade and base course for asphalt paving, or layer placed between the subgrade and a concrete pavement or walk.

E. Subgrade: Surface or elevation remaining after completing excavation, or top surface of a fill or backfill immediately below subbase, drainage fill, or topsoil materials.

1.6 SUBMITTALS

A. See Division 1 Specification Sections for submittal procedures.

B. See Section 312000 Earth Moving for additional requirements.

C. Material Test Reports: From a qualified testing agency indicating and interpreting test results for compliance of the following with requirements indicated:

1. Classification according to ASTM D2487 of each proposed type of aggregate material.
2. Laboratory compaction curves according to ASTM D698 for each proposed type of aggregate material.
3. Laboratory compaction curves according to ASTM D1557 for each proposed type of aggregate material.
4. Aggregate Composition Test Reports: Results of laboratory tests on proposed and actual materials used.

D. Materials Sources: Submit name of imported materials sources if import material is required.

1.7 QUALITY ASSURANCE

A. Codes and Standards: Perform excavation work in compliance with applicable requirements of authorities having jurisdiction.

B. Perform Work in accordance with State of South Carolina Highway Department Standard Specifications.

1. Maintain one copy on site.

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

D. Geotechnical Testing and Inspection Service: The Owner will employ and pay for a qualified independent Geotechnical Testing Agency to perform soil testing and inspection services during earthwork operations. The Contractor shall schedule his work in such a manner to permit a reasonable amount of time for testing to be performed before placing succeeding lifts of fill material and shall keep the Testing Agency informed of all progress.

1. The Owner shall pay for the cost of initial testing, subsequent tests, which are required as a result of a test failure, shall be paid for by the Contractor.

E. Geotechnical Testing Agency Qualifications: An independent testing agency qualified according to ASTM E329 to conduct soil materials and rock-definition testing, as documented according to ASTM D3740 and ASTM E548.

F. Use of Explosives: Use of explosives is NOT permitted on the Owner's property.

G. Pre-Excavation Conference: Conduct conference at Project site to comply with requirements in Division 1 Specification Sections.

1.8 PROJECT CONDITIONS

A. Provide sufficient quantities of aggregate to meet project schedule and requirements. When necessary, store materials on-site in advance of need.

B. When aggregate materials need to be stored on-site, locate stockpiles as directed by the Architect/Engineer and or Construction Manager.

1. Separate differing materials with dividers or stockpile separately to prevent intermixing.
2. Prevent contamination.
3. Protect stockpiles from erosion and deterioration of materials.

C. Verify that survey benchmarks and intended elevations of Work are as indicated.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Use locally available materials and gradations which exhibit a satisfactory record of previous installations.

B. Subbase: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D2940; with at least 90-percent passing a 1-1/2-inch sieve and not more than 12-percent passing a No. 200 sieve.

C. Base: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D2940; with at least 95-percent passing a 1-1/2-inch sieve and not more than 8-percent passing a No. 200 sieve.

D. Drainage Fill: Washed, narrowly graded mixture of crushed stone, or crushed or uncrushed gravel; ASTM D448; coarse-aggregate grading Size 57; with 100-percent passing a 1-1/2- inch sieve and 0 to 5-percent passing a No. 8 sieve.

E. Filter Material: Narrowly graded mixture of natural or crushed gravel, or crushed stone and natural sand; ASTM D448; coarse-aggregate grading Size 67; with 100-percent passing a 1-inch sieve and 0 to 5-percent passing a No. 4 sieve.

F. Course Aggregate Base for Slabs-on-Grade: Drainage Course – Gravel:

1. Pit Run or Angular Crushed or Natural, washed Stone; free of shale, clay, friable material and debris.

a. Graded in accordance with ASTM D2487 Group Symbol GW, GM.
b. Graded in accordance with SCDOT Standard Specifications, #57 stone and/or #67 stone.

G. Fine Aggregate Base for Slabs-on-Grade: Drainage Course – Sand:

1. Natural river or bank sand; washed; free of silt, clay, loam, friable or soluble materials, and organic matter.

a. Graded in accordance with SCDOT Standard Specifications.
b. Graded in accordance with ASTM D2487 Group Symbol SW, SM.
c. Graded in accordance with ASTM C136; within the following limits:

1) No. 4 sieve: 100-percent passing.
2) No. 14 sieve: 10 to 100-percent passing.
3) No. 50 sieve: 5 to 90-percent passing.
4) No. 100 sieve: 4 to 30-percent passing.
5) No. 200 sieve: 0-percent passing.

H. Medium Aggregate Base for Sidewalks and Pads – Pea Gravel:

1. Natural Stone, Pea Gravel; washed; free of clay, shale, and organic matter.

a. Graded in accordance with ASTM D2487 Group Symbol GM, GC.
b. Graded in accordance with ASTM C136, within the following limits:

1) Minimum Size: 1/4-inch.
2) Maximum Size: 5/8-inch

I. Fine Aggregate Base for Sidewalks and Pads – Sand:

1. Natural river or bank sand; washed; free of silt, clay, loam, friable or soluble materials, and organic matter.

a. Graded in accordance with SCDOT Standard Specifications.
b. Graded in accordance with ASTM D2487 Group Symbol SW, SM.
c. Graded in accordance with ASTM C136; within the following limits:

1) No. 4 sieve: 100-percent passing.
2) No. 14 sieve: 10 to 100-percent passing.
3) No. 50 sieve: 5 to 90-percent passing.
4) No. 100 sieve: 4 to 30-percent passing.

2. No. 200 sieve: 0-percent passing.

J. Macadamized Aggregate Base Course for Roads and Parking Areas:

1. In accordance with SCDOT Standard Specifications, Section 305.

K. Herbicide: Commercial chemical for weed control, registered by the EPA. Provide in granular, liquid, or wettable powder form.

2.2 SOURCE QUALITY CONTROL

A. See Division 1 Specification Sections for general requirements for testing and analysis of aggregate materials.

B. Where aggregate materials are specified using ASTM D2487 classification, test and analyze samples for compliance before delivery to project site.

C. Where aggregate materials are specified using ASTM D2487 classification, testing and analysis of samples for compliance will be provided before delivery to project site.

D. If tests indicate materials do not meet specified requirements, change material and retest.

E. Provide materials of each type from same source throughout the Work.

2.3 ACCESSORIES

A. Separation Fabric: Woven geotextile, specifically manufactured for use as a separation geotextile; made from polyolefins, polyesters, or polyamides; and with the following minimum properties determined according to SCDOT Standard Specifications Section 804.11 (2000), ASTM D4759, and referenced standard test methods:

1. Grab Tensile Strength: 200 lbs.; ASTM D4632.
2. Tear Strength: 80 lbs.; ASTM D4533.
3. Puncture Resistance: 80 lbs.; ASTM D4833.
4. Water Flow Rate: 4 gpm per sq. ft.; ASTM D4491.
5. Apparent Opening Size: No. 30; ASTM D4751.

PART 3 - EXECUTION

3.1 EXAMINATION

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

3.2 PREPARATION

A. The subgrade shall be brought to the line and grade necessary to accommodate the base and pavement at the required finish grades. All subgrade shall be proof-rolled before base course is placed on the subgrade. Proof-rolling should be performed with a loaded tandem dump truck (15-cuyd heaped) or as specified in SCDOT Standard Specifications. Test rolling shall be performed parallel to the centerline at speeds between 2 and 5-miles per hour.

B. The surface of the base course will be inspected by the Architect/Engineer for adequate compaction and surface tolerances. Any ruts or soft yielding spots that may appear in the base course, any areas having inadequate compaction, and any deviations of the surface from the requirements specified for the base course shall be corrected by loosening the affected areas, removing unsatisfactory materials, adding approved materials where required, and by reshaping and re-compacting to line and grade to the specified density requirements.

C. Compaction of the base course materials shall be performed by conventional means using a 30,000 to 40,000 lbs vibratory roller or other means of obtaining the required compaction.

D. Correct irregularities in substrate gradient and elevation by scarifying, reshaping, and re-compacting.

E. Do not place aggregate on soft, muddy, or frozen surfaces.

3.3 INSTALLATION

A. Spread aggregate base course over prepared subgrade to a total compacted thickness as indicated in the Construction Details, per pavement section type, of the Drawings.

B. The aggregate shall be spread on the subgrade with a mechanical spreader capable of placing the material to uniform loose depth and without segregation of aggregate, except for areas inaccessible to a mechanical spreader. The aggregate material may be placed by other methods approved by the Architect/Engineer.

C. Place aggregate base course in the following layer thicknesses and roller compact.

1. If total thickness is 6-inches or less, place aggregate in one (1) layer.
2. If total thickness is greater than 6-inches, place aggregate in maximum 4-inch lifts to desired total thickness.

D. No base course material shall be placed on frozen or wet subgrade or base. Hauling equipment shall not be operated on subgrade.

E. Utilize methods of handing, hauling, and placing aggregate which will minimize segregation and contamination of aggregate materials.

F. Aggregate which is contaminated with foreign materials to the extent that the base course will not adequately serve its intended use shall be removed and replaced with acceptable materials by the Contractor at no additional cost to the Owner.

G. Level and contour surfaces to elevations and gradients indicated.

H. Add small quantities of fine aggregates to coarse aggregates as appropriate to assist in compaction.

I. Compact placed aggregate materials to achieve compaction as specified in Section 312000 Earth Moving.

J. Add water to assist in compaction, if necessary. If excess water is apparent, remove aggregate and aerate to reduce moisture.

K. Use manual tamping equipment in areas inaccessible to roller compaction equipment.

L. Apply primer coat to finished surfaces under roads and parking areas in conformance with SCDOT Standard Specifications Sections 401.28. See Section 02741 – Hot-Mix Asphalt Concrete Pavement to addition requirements.

3.4 TOLERANCES:

A. Flatness: Maximum variation of 1/4-inch measured with a 10-foot straight edge.

B. Scheduled Compacted Thickness: Plus or minus 1/4-inch from required thickness.

C. Variation from Design Elevation: Plus or minus 1/2-inch from required elevation.

3.5 FIELD QUALITY CONTROL

A. See Division 1 Specification Sections for general requirements for field inspection and testing.

B. Testing Agency: The Owner will engage a qualified independent geotechnical engineering testing agency to perform field quality control testing.

C. Allow Testing Agency to inspect and test subgrades. Proceed with aggregate base course placement only after test results for previously completed work comply with requirements.

D. Testing Agency will test compaction of aggregate base course in place according to ASTM D1556, ASTM D2167, ASTM D2922, and ASTM D2937, as applicable and to the current edition of SCDOT Standard Specifications. Tests will be performed at the following locations and frequencies:

1. Paved and Building Slab Areas: At subgrade and at each compacted aggregate base course layer, at least one (1) test for every 2,000 sq. ft. or less of paved area or building slab, but in no case fewer than three (3) tests.

E. Testing Agency will test compaction of aggregate base course in place according to the current edition of SCDOT Standard Specifications. Tests will be performed at the following locations and frequencies:

1. Roadway Areas: At subgrade and at each compacted aggregate base course layer, at least one (1) test for every 3,600 sq. ft. or less of paved area, but in no case fewer than two (2) tests.

F. If test indicate Work does not meet specified requirements, remove Work, replace and retest at no additional cost to the Owner.

G. Proof roll compacted aggregate base courses at surfaces that will be under slabs-on-grade, pavers, and pavements.

3.6 CLEAN-UP

A. Remove unused stockpiled materials, leave area in a clean and neat condition. Grade stockpile area to prevent standing water.

END OF SECTION 02 72 10

DIVISION 03 – CONCRETE

SECTION 03 37 13 - SHOTCRETE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes shotcrete applied by dry-mix or wet-mix process.

1.3 DEFINITIONS

A. Shotcrete: Mortar or concrete pneumatically projected onto a surface at high velocity.

B. Dry-Mix Shotcrete: Shotcrete with most of the mixing water added at nozzle.

C. Wet-Mix Shotcrete: Shotcrete with ingredients, including mixing water, mixed before introduction into delivery hose.

1.4 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product including reinforcement and forming accessories, shotcrete materials, admixtures, and curing compounds.

B. LEED Submittals:

1. Product Data for Credit MR 4: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content. Include statement indicating cost for each product having recycled content.
2. Product Certificates for Credit MR 5: For products and materials required to comply with requirements for regional materials, certificates indicating location of material manufacturer and point of extraction, harvest, or recovery for each raw material. Include statement indicating distance to Project, cost for each regional material, and fraction by weight that is considered regional.

C. Design Mixtures: For each shotcrete mixture. Submit alternate design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.

1. For predampened dry-mix mixtures, indicate amounts of mixing water to be added to the dry-mix materials before mixing and conveying through the delivery hose.

D. Shop Drawings: For shotcrete installation. Include support and anchor details; reinforcement materials and grades and details of fabricating, bending, and placing reinforcement; number and location of splices; special reinforcement required for openings through shotcrete structures; formwork materials and details of formwork fabrication, assembly, and support; and locations of proposed construction joints.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Material Certificates: For each of the following:

1. Cementitious materials.
2. Admixtures.

C. Preconstruction Test Reports: For shotcrete.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: A qualified installer employing nozzle operators for the Project, each of whom is ACI Shotcrete Nozzleman certified in Dry-Mix Process for Vertical Position or is ACI Shotcrete Nozzleman certified in Wet-Mix Process for Vertical Position as appropriate to the required shotcrete work.

B. ACI Publications: Comply with ACI 506.2, "Specification for Shotcrete," unless modified by requirements in the Contract Documents.

C. Shotcrete Testing Service: Engage a qualified independent testing agency to perform material evaluation tests and to design shotcrete mixtures.

1.8 PRECONSTRUCTION TESTING

A. Preconstruction Testing Service: Owner will engage a qualified independent testing agency to perform preconstruction testing and inspections indicated below:

1. Produce shotcrete test panels before shotcrete placement according to requirements in ACI 506.2 and ASTM C 1140 for each design mixture, shooting orientation, and nozzle operator. Produce test panels with dimensions of 24 by 24 inches (600 by 600 mm) minimum and of average thickness of shotcrete, but not less than 3-1/2 inches (90 mm).
2. From each test panel, testing agency will obtain six test specimens: one set of three specimens unreinforced and one set of three specimens reinforced. Agency will perform the following:

   a. Strength Testing: Test each set of unreinforced specimens for compressive strength according to ASTM C 42/C 42M.

PART 2 - PRODUCTS

2.1 REINFORCING MATERIALS

A. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.

B. Reinforcing Bars: ASTM A 615/A 615M, Grade 60 (Grade 420), deformed.

C. Plain-Steel Wire: ASTM A 82/A 82M, as drawn.

D. Plain-Steel Welded Wire Reinforcement: ASTM A 185/A 185M, plain, fabricated from as-drawn steel wire into flat sheets.

E. Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded-wire fabric in place; manufactured according to CRSI's "Manual of Standard Practice" and as follows:

1. For uncoated reinforcement, use all-plastic bar supports.

F. Reinforcing Anchors: ASTM A 36/A 36M, unheaded rods or ASTM A 307, Grade A (ASTM F 568M, Property Class 4.6), hex-head bolts; carbon steel; and carbon-steel nuts.

1. Finish: Hot-dip zinc coating, ASTM A 153/A 153M, Class C.

G. Zinc Repair Material: ASTM A 780, zinc-based solder, paint containing zinc dust, or sprayed zinc.

2.2 SHOTCRETE MATERIALS

A. Regional Materials: Provide shotcrete that has been manufactured within 500 miles (800 km) of Project site from aggregates and cement that have been extracted, harvested, or recovered, as well as manufactured, within 500 miles (800 km) of Project site.

B. Source Limitations for Shotcrete: Obtain each color, size, type, and variety of shotcrete material and shotcrete mixture from single manufacturer with resources to provide shotcrete of consistent quality in appearance and physical properties.

C. Portland Cement: ASTM C 150, Type I. Use only one brand and type of cement for Project.

1. Fly Ash: ASTM C 618, Class C or Class F.

D. Normal-Weight Aggregates: ASTM C 33, from a single source, and as follows:

1. Combined Aggregate Size: ACI 506R or ASTM C 1436, Grading No. 1 sieve analysis.
2. Deleterious Substances: As specified for fine aggregate according to ASTM C 33.

E. Lightweight Aggregates: ASTM C 330.

1. Combined Aggregate Size: ACI 506R, Grading No. 1 sieve analysis.

F. Water: Potable, complying with ASTM C 94/C 94M, free from deleterious materials that may affect color stability, setting, or strength of shotcrete.

G. Carbon-Steel Fiber: ASTM A 820/A 820M, Type I, cold-drawn wire or Type II, cut sheet, deformed, nominal length of 0.5 inch (13 mm) 1.5 inches (38 mm), and aspect ratio of 45 to 50.

H. Synthetic Fiber: fibrillated polypropylene fibers engineered and designed for use in shotcrete, complying with ASTM C 1116/C 1116M, Type III, 1 to 1.5 inches (25 to 38 mm) long.

I. Ground Wire: High-strength steel wire, 0.8 to 1.0 mm in diameter.

J. Joint Filler Strips: ASTM D 1751, asphalt-saturated cellulosic fiber.

2.3 ADMIXTURES

A. General: ASTM C 1141, Class A (liquid) or Class B (non-liquid), but limited to the following admixture materials. Provide admixtures for shotcrete that contain not more than 0.1 percent chloride ions. Certify compatibility of admixtures with each other and with other cementitious materials.

1. Accelerating Admixture, Conventional: ASTM C 494/C 494M, Type C or Type E.
2. Pozzolanic Admixture: Fly ash, as limited in "Shotcrete Materials" Article.

2.4 CURING MATERIALS

A. Absorptive Cover: AASHTO M 182, Class 3, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. (305 g/sq. m) dry, or cotton mats.

B. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.

C. Water: Potable.

D. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B.

2.5 SHOTCRETE MIXTURES, GENERAL

A. Prepare design mixtures for each type and strength of shotcrete, proportioned on the basis of laboratory trial mixture or field test data, or both, according to ACI 506.2.

1. Use a qualified independent testing agency for preparing and reporting proposed mixture designs based laboratory trial mixture or field test data, or both.

B. Cementitious Materials: Limit use of fly ash to not exceed, in combination, 25 percent of portland cement by weight.

C. Limit water-soluble chloride ions to maximum percentage by weight of cement or cementitious materials permitted by ACI 301.

D. Admixtures: When included in shotcrete design mixtures, use admixtures according to manufacturer's written instructions.

E. Design-Mixture Adjustments: Subject to compliance with requirements, shotcrete design-mixture adjustments may be proposed when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant.

2.6 SHOTCRETE MIXTURES

A. Shotcrete Mixture: Proportion mixture to provide shotcrete with the following properties:

1. Compressive Strength (28 Days): Mixture shall be selected to meet the strength requirements of the wall performance design.
2. Air Content: Add air-entraining admixture at manufacturer's prescribed rate to result in normal-weight wet-mix shotcrete having an air content before pumping of 7 percent with a tolerance of plus or minus 1-1/2 percent.
3. Carbon-Steel Fiber: Uniformly disperse in shotcrete mix, according to manufacturer's written instructions, 100 lb/cu. yd. (60 kg/cu. m).

2.7 SHOTCRETE EQUIPMENT

A. Mixing Equipment: Capable of thoroughly mixing shotcrete materials in sufficient quantities to maintain continuous placement.

B. Dry-Mix Delivery Equipment: Capable of discharging aggregate-cement mixture into delivery hose under close control and maintaining continuous stream of uniformly mixed materials at required velocity to discharge nozzle. Equip discharge nozzle with manually operated water-injection system for directing even distribution of water to aggregate-cement mixture.

1. Provide uniform, steady supply of clean, compressed air to maintain constant nozzle velocity while simultaneously operating blow pipe for cleaning away rebound.
2. Provide water supply with uniform pressure at discharge nozzle to ensure uniform mixing with aggregate-cement mix. Provide water pump to system if line water pressure is inadequate.

C. Wet-Mix Delivery Equipment: Capable of discharging aggregate-cement-water mixture accurately, uniformly, and continuously.

2.8 BATCHING AND MIXING

A. Dry-Mix Process: Measure mixture proportions by weight batching according to ASTM C 94/C 94M or by volume batching complying with ASTM C 685/C 685M requirements.

1. In volume batching, adjust fine-aggregate volume for bulking. Test fine-aggregate moisture content at least once daily to determine extent of bulking.
2. Prepackaged shotcrete materials may be used at Contractor's option. Predampen prepackaged shotcrete materials and mix before use.

B. Wet-Mix Process: Measure, batch, mix, and deliver shotcrete according to ASTM C 94/C 94M and ASTM C 1116/C 1116M and furnish batch ticket information.

1. Comply with ASTM C 685/C 685M when shotcrete ingredients are delivered dry and proportioned and mixed on-site.

PART 3 - EXECUTION

3.1 PREPARATION

A. Concrete: Before applying shotcrete, remove unsound or loose materials and contaminants that may inhibit shotcrete bonding. Chip or scarify areas to be repaired to extent necessary to provide sound substrate. Cut edges square and 1/2 inch (13 mm) deep at perimeter of work, tapering remaining shoulder at 1:1 slope into cavity to eliminate square shoulders. Dampen surfaces to saturated, surface-dry condition before shotcreting.

1. Abrasive blast or hydroblast existing surfaces that do not require chipping to remove paint, oil, grease, or other contaminants and to provide roughened surface for proper shotcrete bonding.

B. Earth: Compact and trim to line and grade before placing shotcrete. Do not place shotcrete on frozen surfaces. Dampen surfaces to saturated, surface-dry condition before shotcreting.

C. Rock: Clean rock surfaces of loose materials, mud, and other foreign matter that might weaken shotcrete bonding. Dampen surfaces to saturated, surface-dry condition before shotcreting.

3.2 FORMS

A. General: Design, erect, support, brace, and maintain forms, according to ACI 301, to support shotcrete and construction loads and to facilitate shotcreting. Construct forms so shotcrete members and structures are secured to prevent excessive vibration or deflection during shotcreting.

1. Fabricate forms to be readily removable without impact, shock, or damage to shotcrete surfaces and adjacent materials.
2. Construct forms to required sizes, shapes, lines, and dimensions using ground wires and depth gages to obtain accurate alignment, location, and grades in finished structures. Construct forms to prevent mortar leakage but permit escape of air and rebound during shotcreting. Provide for openings, offsets, blocking, screeds, anchorages, inserts, and other features required in the Work.

B. Form openings, chases, recesses, bulkheads, keyways, and screeds in formwork. Determine sizes and locations from trades providing such items. Accurately place and securely support items built into forms.

3.3 STEEL REINFORCEMENT

A. General: Comply with CRSI's "Manual of Standard Practice" for fabricating, placing, and supporting reinforcement.

B. Clean reinforcement of loose rust and mill scale, earth, ice, and other materials that weaken shotcrete bonding.

C. Securely embed reinforcing anchors into existing substrates, located as required.

D. Accurately position, support, and secure reinforcement against displacement. Locate and support reinforcement with bar supports, bolsters, chairs, spacers, and other devices as required to maintain minimum concrete cover.

E. Set wire ties with ends directed into shotcrete, not toward exposed shotcrete surfaces.

F. Install welded wire reinforcement in longest practical lengths on bar supports spaced to minimize sagging. Lap edges and ends of adjoining sheets at least two mesh spacing. Offset laps of adjoining sheet widths to prevent continuous laps in either direction. Lace overlaps with wire.

3.4 JOINTS

A. General: Construct joints at locations indicated or as approved by Architect.

B. Construction Joints: Locate and install construction joints tapered to a 1:1 slope where joint is not subject to compression loads and square where joint is perpendicular to main reinforcement. Continue reinforcement through construction joints unless otherwise indicated.

C. Contraction Joints: Construct contraction joints in shotcrete using saw cuts 1/8-inch- (3-mm-) wide by 1/3 slab depth or joint-filler strips 1/4-inch- (6-mm-) wide by 1/3 shotcrete depth unless otherwise indicated.

1. After shotcrete has cured, remove strip inserts and clean groove of loose debris.
2. Space joints as required by design horizontally and vertically.
3. Tool edges round on each side of strip inserts if floated or troweled finishes are required.
4. Where shooting over an existing substrate joint, align new shotcrete joint with existing joint.

3.5 ALIGNMENT CONTROL

A. Ground Wires: Install ground wires to establish thickness and planes of shotcrete surfaces. Install ground wires at corners and offsets not established by forms. Pull ground wires taut and position adjustment devices to permit additional tightening.

3.6 EMBEDDED ITEMS

A. Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by shotcrete. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.

3.7 APPLICATION

A. Apply temporary protective coverings and protect adjacent surfaces against deposit of rebound and overspray or impact from nozzle stream.

B. Moisten wood forms immediately before placing shotcrete where form coatings are not used.

C. Apply shotcrete according to ACI 506.2.

D. Apply dry-mix shotcrete materials within 45 minutes after predampening and wet-mix shotcrete materials within 90 minutes after batching.

E. Deposit shotcrete continuously in multiple passes, to required thickness, without cold joints and laminations developing. Place shotcrete with nozzle held perpendicular to receiving surface. Begin shotcreting in corners and recesses.

1. Remove and dispose of rebound and overspray materials during shotcreting to maintain clean surfaces and to prevent rebound entrapment.

F. Maintain reinforcement in position during shotcreting. Place shotcrete to completely encase reinforcement and other embedded items. Maintain steel reinforcement free of overspray, and prevent buildup against front face during shotcreting.

G. Do not place subsequent lifts until previous lift of shotcrete is capable of supporting new shotcrete.

H. Do not permit shotcrete to sag, slough, or dislodge.

I. Remove hardened overspray, rebound, and laitance from shotcrete surfaces to receive additional layers of shotcrete; dampen surfaces before shotcreting.

J. Do not disturb shotcrete surfaces before beginning finishing operations.

K. Remove ground wires or other alignment-control devices after shotcrete placement.

L. Installation Tolerances: Place shotcrete without exceeding installation tolerances permitted by ACI 117, increased by a factor of two.

M. Cold-Weather Shotcreting: Mix, place, and protect shotcrete according to ACI 306.1 and as follows. Protect shotcrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.

1. Discontinue shotcreting when ambient temperature is 40 deg F (4.4 deg C) and falling.
2. Uniformly heat water and aggregates before mixing to obtain a shotcrete shooting temperature of not less than 50 deg F (10 deg C) and not more than 90 deg F (32 deg C).
3. Do not use frozen materials or materials containing ice or snow.
4. Do not place shotcrete on frozen surfaces or surfaces containing frozen materials.
5. Do not use calcium chloride, salt, or other materials containing antifreeze agents.

N. Hot-Weather Shotcreting: Mix, place, and protect shotcrete according to recommendations of ACI 305R when hot-weather conditions and high temperatures would seriously impair quality and strength of shotcrete, and as follows:

1. Cool ingredients before mixing to maintain shotcrete temperature at time of placement below 100 deg F (38 deg C) for dry mix or 90 deg F (32 deg C) for wet mix.
2. Reduce temperature of reinforcing steel and receiving surfaces below 100 deg F (38 deg C) before shotcreting.

3.8 SURFACE FINISHES

A. General: Finish shotcrete according to descriptions in ACI 506R.

B. Natural Finishes:

1. Gun Finish: Natural undisturbed finish as sprayed.

3.9 CURING

A. Protect freshly placed shotcrete from premature drying and excessive cold or hot temperatures.

B. Begin curing immediately after placing and finishing but not before free water, if any, has disappeared from shotcrete surface.

C. Curing Exposed Surfaces: Cure shotcrete by one of the following methods:

1. Moisture Curing: Keep surfaces continuously moist for not less than seven days with the following materials:

   a. Water.
   b. Continuous water-fog spray.
   c. Water-saturated absorptive covers or moisture-retaining covers. Lap and seal sides and ends of covers with 12-inch (300-mm) lap over adjacent covers.

2. Curing Compound: Apply uniformly in continuous operation by power spray according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period.

   a. Apply curing compound to natural gun finish or flash-coat shotcrete at rate of 1 gal./100 sq. ft. (1 L/2.5 sq. m).

D. Curing Formed Surfaces: Cure formed shotcrete surfaces by moist curing with forms in place for full curing period or until forms are removed. If forms are removed, continue curing by methods specified above, as applicable.

3.10 FORM REMOVAL

A. Forms not supporting weight of shotcrete may be removed after curing for 24 consecutive hours at not less than 50 deg F (10 deg C), provided shotcrete is hard enough not to be damaged by form-removal operations and provided curing and protecting operations are maintained.

1. Leave forms supporting weight of shotcrete in place until shotcrete has attained design compressive strength. Determine compressive strength of in-place shotcrete by testing representative field-cured specimens of shotcrete.
2. Remove forms only if shores have been arranged to permit removal of forms without loosening or disturbing shores.

B. Clean and repair surfaces of forms to be reused in the Work. Split, frayed, delaminated, or otherwise damaged form-facing materials are unacceptable for exposed surfaces. Apply new form-coating compound as specified for new formwork.

3.11 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified testing agency to sample materials, visually grade cores, perform tests, and submit reports during shotcreting.

B. Air Content: ASTM C 173/C 173M, volumetric method or ASTM C 231, pressure method; one test for each compressive-strength test for each mixture of air-entrained, wet-mix shotcrete measured before pumping.

C. Shotcrete Temperature: ASTM C 1064/C 1064M; one test hourly when air temperature is 40 deg F (4.4 deg C) and below and when 80 deg F (27 deg C) and above, and one test for each set of compressive-strength specimens.

D. Test Panels: Make a test panel, reinforced as in structure, for each shotcrete mixture and for each workday or for every 50 cu. yd. (38 cu. m) of shotcrete placed, whichever is less. Produce test panels with dimensions of 24 by 24 inches (600 by 600 mm) minimum and of average thickness of shotcrete, but not less than 4-1/2 inches (115 mm). Testing agency will obtain sets of test specimens from each test panel.

1. Compressive Strength Testing: One set of three unreinforced specimens. Test each set of unreinforced specimens for compressive strength according to ASTM C 1140 and construction testing requirements in ACI 506.2.
2. Visual Core Grading: One set of three reinforced specimens. Visually inspect each set of reinforced shotcrete cores taken from test panels and determine mean core grades according to ACI 506.2.

E. Strength of shotcrete will be considered satisfactory according to the following:

1. Specimen Cores: Mean compressive strength of each set of three unreinforced cores equals or exceeds 85 percent of specified compressive strength, with no individual core less than 75 percent of specified compressive strength.
2. Specimen Cubes: Mean compressive strength of each set of three unreinforced cubes shall equal or exceed design compressive strength with no individual cube less than 88 percent of specified compressive strength.

3.12 REPAIRS

A. Remove and replace shotcrete that is delaminated or exhibits laminations, voids, or sand/rock pockets exceeding limits for specified core grade of shotcrete.

1. Remove unsound or loose materials and contaminants that may inhibit bond of shotcrete repairs.
2. Chip or scarify areas to be repaired to extent necessary to provide sound substrate. Cut edges square and 1/2 inch (13 mm) deep at perimeter of work, tapering remaining shoulder at 1:1 slope into cavity to eliminate square shoulders.
3. Dampen surfaces and apply new shotcrete.

B. Repair core holes from in-place testing according to repair provisions in ACI 301, except do not use shotcrete. Match adjacent color and finish.

3.13 CLEANING

A. Immediately remove and dispose of rebound and overspray materials from final shotcrete surfaces and areas not intended for shotcrete placement.

END OF SECTION 03 37 13

DIVISION 22 - PLUMBING

SECTION 22 11 13 - FACILITY WATER DISTRIBUTION PIPING

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes water-distribution piping and related components outside the building for combined water service and fire-service mains.

B. Utility-furnished products include water meters that will be furnished to the site, ready for installation.

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

1.2 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: Detail precast concrete vault assemblies and indicate dimensions, method of field assembly, and components.

C. Field quality-control test reports.

D. Operation and maintenance data.

1.3 DEFINITIONS

A. EPDM: Ethylene propylene diene terpolymer rubber.

B. LLDPE: Linear, low-density polyethylene plastic.

C. PA: Polyamide (nylon) plastic.

D. PE: Polyethylene plastic.

E. PP: Polypropylene plastic.

F. PVC: Polyvinyl chloride plastic.

G. RTRF: Reinforced thermosetting resin (fiberglass) fittings.

H. RTRP: Reinforced thermosetting resin (fiberglass) pipe.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: Detail precast concrete vault assemblies and indicate dimensions, method of field assembly, and components.

1. Wiring Diagrams: Power, signal, and control wiring for alarms.

1.5 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: For piping and specialties including relation to other services in same area, drawn to scale. Show piping and specialty sizes and valves, meter and specialty locations, and elevations.

B. Field quality-control test reports.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For water valves and specialties to include in emergency, operation, and maintenance manuals.

1.7 QUALITY ASSURANCE

A. Regulatory Requirements:

1. Comply with requirements of utility company supplying water. Include tapping of water mains and backflow prevention.
2. Comply with standards of authorities having jurisdiction for potable-water-service piping, including materials, installation, testing, and disinfection.
3. Comply with standards of authorities having jurisdiction for fire-suppression water-service piping, including materials, hose threads, installation, and testing.

B. Piping materials shall bear label, stamp, or other markings of specified testing agency.

C. Comply with ASTM F 645 for selection, design, and installation of thermoplastic water piping.

D. Comply with FMG's "Approval Guide" or UL's "Fire Protection Equipment Directory" for fire-service-main products.

E. NFPA Compliance: Comply with NFPA 24 for materials, installations, tests, flushing, and valve and hydrant supervision for fire-service-main piping for fire suppression.

F. NSF Compliance:

1. Comply with NSF 14 for plastic potable-water-service piping. Include marking "NSF-pw" on piping.
2. Comply with NSF 61 for materials for water-service piping and specialties for domestic water.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Preparation for Transport: Prepare valves, including fire hydrants, according to the following:

1. Ensure that valves are dry and internally protected against rust and corrosion.
2. Protect valves against damage to threaded ends and flange faces.
3. Set valves in best position for handling. Set valves closed to prevent rattling.

B. During Storage: Use precautions for valves, including fire hydrants, according to the following:

1. Do not remove end protectors unless necessary for inspection; then reinstall for storage.
2. Protect from weather. Store indoors and maintain temperature higher than ambient dew-point temperature. Support off the ground or pavement in watertight enclosures when outdoor storage is necessary.

C. Handling: Use sling to handle valves and fire hydrants if size requires handling by crane or lift. Rig valves to avoid damage to exposed parts. Do not use handwheels or stems as lifting or rigging points.

D. Deliver piping with factory-applied end caps. Maintain end caps through shipping, storage, and handling to prevent pipe-end damage and to prevent entrance of dirt, debris, and moisture.

E. Protect stored piping from moisture and dirt. Elevate above grade. Do not exceed structural capacity of floor when storing inside.

F. Protect flanges, fittings, and specialties from moisture and dirt.

G. Store plastic piping protected from direct sunlight. Support to prevent sagging and bending.

1.9 PROJECT CONDITIONS

A. Interruption of Existing Water-Distribution Service: Do not interrupt service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary water-distribution service according to requirements indicated:

1. Notify Owner no fewer than two days in advance of proposed interruption of service.
2. Do not proceed with interruption of water-distribution service without Owner's written permission.

1.10 COORDINATION

A. A city-approved contractor shall make connection to watermain

PART 2 - PRODUCTS

2.1 PIPE AND FITTINGS

A. Soft Copper Tube: ASTM B 88, Type K (ASTM B 88M, Type A) and ASTM B 88, Type L (ASTM B 88M, Type B), water tube, annealed temper.

1. Copper, Solder-Joint Fittings: ASME B16.18, cast-copper-alloy or ASME B16.22, wrought-copper, solder-joint pressure type. Furnish only wrought-copper fittings if indicated.

B. Hard Copper Tube: ASTM B 88, Type K (ASTM B 88M, Type A) and ASTM B 88, Type L (ASTM B 88M, Type B), water tube, drawn temper.

1. Copper, Solder-Joint Fittings: ASME B16.18, cast-copper-alloy or ASME B16.22, wrought-copper, solder-joint pressure type. Furnish only wrought-copper fittings if indicated.

C. Mechanical-Joint, Ductile-Iron Pipe: AWWA C151, with mechanical-joint bell and plain spigot end unless grooved or flanged ends are indicated.

1. Mechanical-Joint, Ductile-Iron Fittings: AWWA C110, ductile- or gray-iron standard pattern or AWWA C153, ductile-iron compact pattern.
2. Glands, Gaskets, and Bolts: AWWA C111, ductile- or gray-iron glands, rubber gaskets, and steel bolts.

D. Push-on-Joint, Ductile-Iron Pipe: AWWA C151, with push-on-joint bell and plain spigot end unless grooved or flanged ends are indicated.

1. Push-on-Joint, Ductile-Iron Fittings: AWWA C110, ductile- or gray-iron standard pattern or AWWA C153, ductile-iron compact pattern.
2. Gaskets: AWWA C111, rubber.
3. Flanges: ASME 16.1, Class 125, cast iron.

E. Grooved-Joint, Ductile-Iron Pipe: AWWA C151, with cut, rounded-grooved ends.

1. Grooved-End, Ductile-Iron Pipe Appurtenances:

a. Manufacturers: Subject to compliance with requirements.

F. PE, Fire-Service Pipe: ASTM F 714, AWWA C906, or equivalent for PE water pipe; FMG approved, with minimum thickness equivalent to FMG Class 150 and Class 200.

1. Molded PE Fittings: ASTM D 3350, PE resin, socket- or butt-fusion type, made to match PE pipe dimensions and class.

G. PVC, AWWA Pipe: AWWA C900, Class 150 and Class 200, with bell end with gasket, and with spigot end.

1. Comply with UL 1285 for fire-service mains if indicated.
2. PVC Fabricated Fittings: AWWA C900, Class 150 and Class 200, with bell-and-spigot or double-bell ends. Include elastomeric gasket in each bell.
3. PVC Molded Fittings: AWWA C907, Class 150, with bell-and-spigot or double-bell ends. Include elastomeric gasket in each bell.
4. Push-on-Joint, Ductile-Iron Fittings: AWWA C110, ductile- or gray-iron standard pattern or AWWA C153, ductile-iron compact pattern.

a. Gaskets: AWWA C111, rubber.

5. Mechanical-Joint, Ductile-Iron Fittings: AWWA C110, ductile- or gray-iron standard pattern or AWWA C153, ductile-iron compact pattern.

a. Glands, Gaskets, and Bolts: AWWA C111, ductile- or gray-iron glands, rubber gaskets, and steel bolts.

2.2 JOINING MATERIALS

A. Brazing Filler Metals: AWS A5.8, BCuP Series.

B. Bonding Adhesive for Fiberglass Piping: As recommended by fiberglass piping manufacturer.

C. Plastic Pipe-Flange Gasket, Bolts, and Nuts: Type and material recommended by piping system manufacturer, unless otherwise indicated.

2.3 PIPING SPECIALTIES

A. Transition Fittings: Manufactured fitting or coupling same size as, with pressure rating at least equal to and ends compatible with, piping to be joined.

B. Tubular-Sleeve Pipe Couplings:

1. Description: Metal, bolted, sleeve-type, reducing or transition coupling, with center sleeve, gaskets, end rings, and bolt fasteners and with ends of same sizes as piping to be joined.

a. Standard: AWWA C219.

2.4 GATE VALVES

A. AWWA, Cast-Iron Gate Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. American AVK Co.; Valves & Fittings Div.
b. American Cast Iron Pipe Co.; American Flow Control Div.
c. American Cast Iron Pipe Co.; Waterous Co. Subsidiary.
d. Crane Co.; Crane Valve Group; Stockham Div.
e. East Jordan Iron Works, Inc.
f. McWane, Inc.; Clow Valve Co. Div. (Oskaloosa).
g. McWane, Inc.; Kennedy Valve Div.
h. McWane, Inc.; M & H Valve Company Div.
i. McWane, Inc.; Tyler Pipe Div.; Utilities Div.
j. Mueller Co.; Water Products Div.
k. NIBCO INC.
l. U.S. Pipe and Foundry Company.
m. Or equal.

2. Nonrising-Stem, Metal-Seated Gate Valves:

a. Description: Gray- or ductile-iron body and bonnet; with cast-iron or bronze double-disc gate, bronze gate rings, bronze stem, and stem nut.

1) Standard: AWWA C500.
2) Minimum Pressure Rating: 200 psig (1380 kPa).
3) End Connections: Mechanical joint.
4) Interior Coating: Complying with AWWA C550.

3. Nonrising-Stem, Resilient-Seated Gate Valves:

   a. Description: Gray- or ductile-iron body and bonnet; with bronze or gray- or ductile-iron gate, resilient seats, bronze stem, and stem nut.

      1) Standard: AWWA C509.
      2) Minimum Pressure Rating: 200 psig (1380 kPa).
      3) End Connections: Mechanical joint.
      4) Interior Coating: Complying with AWWA C550.

4. Nonrising-Stem, High-Pressure, Resilient-Seated Gate Valves:

   a. Description: Ductile-iron body and bonnet; with bronze or ductile-iron gate, resilient seats, bronze stem, and stem nut.

      1) Standard: AWWA C509.
      2) Minimum Pressure Rating: 250 psig (1725 kPa).
      3) End Connections: Push on or mechanical joint.
      4) Interior Coating: Complying with AWWA C550.

5. OS&Y, Rising-Stem, Metal-Seated Gate Valves:

   a. Description: Cast- or ductile-iron body and bonnet, with cast-iron double disc, bronze disc and seat rings, and bronze stem.

      1) Standard: AWWA C500.
      2) Minimum Pressure Rating: 200 psig (1380 kPa).
      3) End Connections: Flanged.

6. OS&Y, Rising-Stem, Resilient-Seated Gate Valves:

   a. Description: Cast- or ductile-iron body and bonnet, with bronze or gray- or ductile-iron gate, resilient seats, and bronze stem.

      1) Standard: AWWA C509.
      2) Minimum Pressure Rating: 200 psig (1380 kPa).
      3) End Connections: Flanged.

B. UL/FMG, Cast-Iron Gate Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. American Cast Iron Pipe Co.; American Flow Control Div.
   b. American Cast Iron Pipe Co.; Waterous Co. Subsidiary.
   c. Crane Co.; Crane Valve Group; Stockham Div.
   d. McWane, Inc.; Clow Valve Co. Div. (Oskaloosa).
   e. McWane, Inc.; Kennedy Valve Div.
   f. McWane, Inc.; M & H Valve Company Div.
   g. Mueller Co.; Water Products Div.
   h. NIBCO INC.
   i. U.S. Pipe and Foundry Company.
   j. Or equal.

2. UL/FMG, Nonrising-Stem Gate Valves:

   a. Description: Iron body and bonnet with flange for indicator post, bronze seating material, and inside screw.

      1) Standards: UL 262 and FMG approved.
      2) Minimum Pressure Rating: 175 psig (1207 kPa).
      3) End Connections: Flanged.

3. OS&Y, Rising-Stem Gate Valves:

   a. Description: Iron body and bonnet and bronze seating material.

      1) Standards: UL 262 and FMG approved.
      2) Minimum Pressure Rating: 175 psig (1207 kPa).
      3) End Connections: Flanged.

C. Bronze Gate Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. Crane Co.; Crane Valve Group; Crane Valves.
   b. Crane Co.; Crane Valve Group; Jenkins Valves.
   c. Crane Co.; Crane Valve Group; Stockham Div.
   d. Hammond Valve.
   e. Milwaukee Valve Company.
   f. NIBCO INC.
   g. Red-White Valve Corporation.
   h. Or equal.

2. OS&Y, Rising-Stem Gate Valves:

   a. Description: Bronze body and bonnet and bronze stem.

      1) Standards: UL 262 and FMG approved.
      2) Minimum Pressure Rating: 175 psig (1207 kPa).
      3) End Connections: Threaded.

3. Nonrising-Stem Gate Valves:

   a. Description: Class 125, Type 1, bronze with solid wedge, threaded ends, and malleable-iron handwheel.

      1) Standard: MSS SP-80.

2.5 GATE VALVE ACCESSORIES AND SPECIALTIES

A. Tapping-Sleeve Assemblies:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. American Cast Iron Pipe Co.; Waterous Co. Subsidiary.
b. East Jordan Iron Works, Inc.
c. Flowserve.
d. McWane, Inc.; Clow Valve Co. Div. (Oskaloosa).
e. McWane, Inc.; Kennedy Valve Div.
f. McWane, Inc.; M & H Valve Company Div.
g. Mueller Co.; Water Products Div.
h. U.S. Pipe and Foundry Company.
i. Or equal.

2. Description: Sleeve and valve compatible with drilling machine.

a. Standard: MSS SP-60.
b. Tapping Sleeve: Cast- or ductile-iron or stainless-steel, two-piece bolted sleeve with flanged outlet for new branch connection. Include sleeve matching size and type of pipe material being tapped and with recessed flange for branch valve.
c. Valve: AWWA, cast-iron, nonrising-stem, metal-seated gate valve with one raised face flange mating tapping-sleeve flange.

B. Valve Boxes: Comply with AWWA M44 for cast-iron valve boxes. Include top section, adjustable extension of length required for depth of burial of valve, plug with lettering "WATER," and bottom section with base that fits over valve and with a barrel approximately 5 inches (125 mm) in diameter.

1. Operating Wrenches: Steel, tee-handle with one pointed end, stem of length to operate deepest buried valve, and socket matching valve operating nut.

C. Indicator Posts: UL 789, FMG-approved, vertical-type, cast-iron body with operating wrench, extension rod, and adjustable cast-iron barrel of length required for depth of burial of valve.

2.6 CORPORATION VALVES AND CURB VALVES

A. Manufacturers:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Amcast Industrial Corporation; Lee Brass Co.
b. Ford Meter Box Company, Inc. (The); Pipe Products Div.
c. Jones, James Company.
d. Master Meter, Inc.
e. McDonald, A. Y. Mfg. Co.
f. Mueller Co.; Water Products Div.
g. Red Hed Manufacturing & Supply.
h. Or equal.

B. Service-Saddle Assemblies: Comply with AWWA C800. Include saddle and valve compatible with tapping machine.

1. Service Saddle: Copper alloy with seal and AWWA C800, threaded outlet for corporation valve.
2. Corporation Valve: Bronze body and ground-key plug, with AWWA C800, threaded inlet and outlet matching service piping material.

3. Manifold: Copper fitting with two to four inlets as required, with ends matching corporation valves and outlet matching service piping material.

C. Curb Valves: Comply with AWWA C800. Include bronze body, ground-key plug or ball, and wide tee head, with inlet and outlet matching service piping material.

D. Service Boxes for Curb Valves: Similar to AWWA M44 requirements for cast-iron valve boxes. Include cast-iron telescoping top section of length required for depth of burial of valve, plug with lettering "WATER," and bottom section with base that fits over curb valve and with a barrel approximately 3 inches (75 mm) in diameter.

1. Shutoff Rods: Steel, tee-handle with one pointed end, stem of length to operate deepest buried valve, and slotted end matching curb valve.

2.7 WATER METERS

A. Water meter fees will be paid by Owner. Meters will be furnished by City and installed by City approved contractor.

2.8 CONCRETE VAULTS

A. Vaults shall meet requirement of City.

2.9 FIRE HYDRANTS

A. Wet-Barrel Fire Hydrants:

1. Fire hydrant shall meet requirements of City.

2.10 BACKFLOW PREVENTERS

A. Reduced-Pressure-Principle Backflow Preventers:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. Ames Fire & Waterworks; a division of Watts Regulator Co.
   b. Conbraco Industries, Inc.
   c. FEBCO; SPX Valves & Controls.
   d. Flomatic Corporation.
   e. Watts Water Technologies, Inc.
   f. Wilkins; a Zurn company.
   g. Or equal.

2. Standard: ASSE 1013 or AWWA C511.
3. Operation: Continuous-pressure applications.
4. Body: Bronze for NPS 2 (DN 50) and smaller; cast iron with interior lining complying with AWWA C550 or that is FDA approved for NPS 2-1/2 (DN 65) and larger.
5. End Connections: Threaded for NPS 2 (DN 50) and smaller; flanged for NPS 2-1/2 (DN 65) and larger.

6. Configuration: Designed for horizontal, straight through flow.
7. Accessories:

   a. Valves: Ball type with threaded ends on inlet and outlet of NPS 2 (DN 50) and smaller; OS&Y gate type with flanged ends on inlet and outlet of NPS 2-1/2 (DN 65) and larger.
   b. Air-Gap Fitting: ASME A112.1.2, matching backflow preventer connection.

B. Double-Check, Backflow-Prevention Assemblies:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. Ames Fire & Waterworks; a division of Watts Regulator Co.
   b. Conbraco Industries, Inc.
   c. FEBCO; SPX Valves & Controls.
   d. Flomatic Corporation.
   e. Watts Water Technologies, Inc.
   f. Wilkins; a Zurn company.

2. Standard: ASSE 1015 or AWWA C510.
3. Operation: Continuous-pressure applications, unless otherwise indicated.
4. Body: Bronze for NPS 2 (DN 50) and smaller; cast iron with interior lining complying with AWWA C550 or that is FDA approved for NPS 2-1/2 (DN 65) and larger.
5. End Connections: Threaded for NPS 2 (DN 50) and smaller; flanged for NPS 2-1/2 (DN 65) and larger.
6. Configuration: Designed for horizontal, straight through flow.
7. Accessories: Ball valves with threaded ends on inlet and outlet of NPS 2 (DN 50) and smaller; OS&Y gate valves with flanged ends on inlet and outlet of NPS 2-1/2 (DN 65) and larger.

2.11 WATER METER BOXES

A. Description: Cast-iron body and cover for disc-type water meter, with lettering "WATER METER" in cover; and with slotted, open-bottom base section of length to fit over service piping.

1. Option: Base section may be cast-iron, PVC, clay, or other pipe.

B. Description: Cast-iron body and double cover for disc-type water meter, with lettering "WATER METER" in top cover; and with separate inner cover; air space between covers; and slotted, open-bottom base section of length to fit over service piping.

C. Description: Polymer-concrete body and cover for disc-type water meter, with lettering "WATER" in cover; and with slotted, open-bottom base section of length to fit over service piping. Include vertical and lateral design loadings of 15,000 lb minimum over 10 by 10 inches (6800 kg minimum over 254 by 254 mm) square.

2.12 CONCRETE VAULTS

2.13 FIRE DEPARTMENT CONNECTIONS

A. Fire Department Connections:

1. Fire department connection shall meet requirements of City Fire Department.

PART 3 - EXECUTION

3.1 EARTHWORK

A. Refer to Division 31 Section "Earth Moving" for excavating, trenching, and backfilling.

3.2 PIPING APPLICATIONS

A. General: Use pipe, fittings, and joining methods for piping systems according to the following applications.

B. Transition couplings and special fittings with pressure ratings at least equal to piping pressure rating may be used, unless otherwise indicated.

C. Do not use flanges or unions for underground piping.

D. Flanges, unions, and special fittings may be used, instead of joints indicated, on aboveground piping and piping in vaults.

E. Underground water-service piping NPS 3/4 to NPS 3 (DN 20 to DN 80) shall be soft copper tube, ASTM B 88, Type L (ASTM B 88M, Type B); wrought-copper, solder-joint fittings; and brazed joints.

F. Underground water-service piping NPS 4 and NPS 6 (DN 100 and DN 150) shall be any of the following:

1. Soft copper tube, ASTM B 88, Type L (ASTM B 88M, Type B); wrought-copper, solder-joint fittings; and brazed joints.
2. Ductile-iron, push-on-joint pipe; ductile-iron, push-on-joint fittings; and gasketed joints.
3. NPS 4 and NPS 6 (DN 100 and DN 150): NPS 6 (DN 150) PVC, AWWA Class 150 pipe; PVC, AWWA Class 150 molded fittings; and gasketed joints.

G. Water Meter Box Water-Service Piping NPS 3/4 to NPS 2 (DN 20 to DN 50) shall be same as underground water-service piping.

H. Aboveground and Vault Water-Service Piping NPS 3/4 to NPS 3 (DN 20 to DN 80) shall be hard copper tube, ASTM B 88, Type L (ASTM B 88M, Type B); wrought-copper, solder-joint fittings; and brazed joints.

I. Aboveground and vault water-service piping NPS 4 and NPS 6 (DN 100 and DN 150) shall be any of the following:

1. Hard copper tube, ASTM B 88, Type L (ASTM B 88M, Type B); wrought-copper, solder-joint fittings; and brazed joints.
2. Ductile-iron, grooved-end pipe; ductile-iron, grooved-end appurtenances; and grooved joints.

J. Underground Fire-Service-Main Piping NPS 4 to NPS 8 (DN 100 to DN 200) shall be any of the following:

1. Ductile-iron, push-on-joint pipe; ductile-iron, push-on-joint fittings; and gasketed joints.
2. PE, Class 150, fire-service pipe; molded PE fittings; and heat-fusion joints.
3. PVC, AWWA Class 150 pipe listed for fire-protection service; PVC Class 150 fabricated or molded fittings; and gasketed joints.
4. PVC, AWWA Class 200 pipe listed for fire-protection service; PVC Class 200 fabricated fittings; and gasketed joints.

K. Aboveground and Vault Fire-Service-Main Piping NPS 4 to NPS 8 (DN 100 to DN 200) shall be ductile-iron, grooved-end pipe; ductile-iron-pipe appurtenances; and grooved joints.

L. Underground Combined Water-Service and Fire-Service-Main Piping NPS 6 to NPS 10 (DN 150 to DN 250) shall be any of the following:

1. Ductile-iron, push-on-joint pipe; ductile-iron, push-on-joint fittings; and gasketed joints.
2. PVC, AWWA Class 150 pipe listed for fire-protection service; PVC fabricated or molded fittings of same class as pipe; and gasketed joints.

M. Aboveground and Vault Combined Water Service and Fire-Service-Main Piping NPS 6 to NPS 10 (DN 150 to DN 250) shall be ductile-iron, grooved-end pipe; ductile-iron-pipe appurtenances; and grooved joints.

3.3 VALVE APPLICATIONS

A. General Application: Use mechanical-joint-end valves for NPS 3 (DN 80) and larger underground installation. Use threaded- or flanged-end valves for installation in vaults. Use UL/FMG, nonrising-stem gate valves for installation with indicator posts. Use corporation valves and curb valves with ends compatible with piping, for NPS 2 (DN 50) and smaller installation.

B. Drawings indicate valve types to be used. Where specific valve types are not indicated, the following requirements apply:

1. Underground Valves, NPS 3 (DN 80) and Larger: AWWA, cast-iron, nonrising-stem, metal-seated gate valves with valve box.
2. Underground Valves, NPS 4 (DN 100) and Larger, for Indicator Posts: UL/FMG, cast-iron, nonrising-stem gate valves with indicator post.
3. Use the following for valves in vaults and aboveground:

   a. Gate Valves, NPS 2 (DN 50) and Smaller: Bronze, rising stem.
   b. Gate Valves, NPS 3 (DN 80) and Larger: AWWA, cast iron, OS&Y rising stem, metal seated.

3.4 PIPING INSTALLATION

A. Comply with NFPA 24 for fire-service-main piping materials and installation.

1. Install copper tube and fittings according to CDA's "Copper Tube Handbook."

B. Install ductile-iron, water-service piping according to AWWA C600 and AWWA M41.

C. Install PE pipe according to ASTM D 2774 and ASTM F 645.

D. Install PVC, AWWA pipe according to ASTM F 645 and AWWA M23.

E. Bury piping with depth of cover over top at least 36 inches, with top at least 12 inches below level of maximum frost penetration.

F. Extend water-service piping and connect to water-supply source and building-water-piping systems at outside face of building wall in locations and pipe sizes indicated.

1. Terminate water-service piping at building wall until building-water-piping systems are installed. Terminate piping with caps, plugs, or flanges as required for piping material. Make connections to building-water-piping systems when those systems are installed.

G. Sleeves are specified in Division 22 Section "Sleeves and Sleeve Seals for Plumbing Piping."

H. Mechanical sleeve seals are specified in Division 22 Section "Sleeves and Sleeve Seals for Plumbing Piping."

I. Install underground piping with restrained joints at horizontal and vertical changes in direction. Use restrained-joint piping, thrust blocks, anchors, tie-rods and clamps, and other supports.

3.5 JOINT CONSTRUCTION

A. Make pipe joints according to the following:

1. Ductile-Iron Piping, Gasketed Joints for Water-Service Piping: AWWA C600 and AWWA M41.
2. Ductile-Iron Piping, Gasketed Joints for Fire-Service-Main Piping: UL 194.
3. Ductile-Iron Piping, Grooved Joints: Cut-groove pipe. Assemble joints with grooved-end, ductile-iron-piping couplings, gaskets, lubricant, and bolts according to coupling manufacturer's written instructions.
4. PE Piping Insert-Fitting Joints: Use plastic insert fittings and fasteners according to fitting manufacturer's written instructions.
5. PVC Piping Gasketed Joints: Use joining materials according to AWWA C900. Construct joints with elastomeric seals and lubricant according to ASTM D 2774 or ASTM D 3139 and pipe manufacturer's written instructions.
6. Dissimilar Materials Piping Joints: Use adapters compatible with both piping materials, with OD, and with system working pressure.

3.6 ANCHORAGE INSTALLATION

A. Anchorage, General: Install water-distribution piping with restrained joints. Anchorages and restrained-joint types that may be used include the following:

1. Concrete thrust blocks.
2. Locking mechanical joints.
3. Set-screw mechanical retainer glands.

4. Bolted flanged joints.
5. Heat-fused joints.
6. Pipe clamps and tie rods.

B. Install anchorages for tees, plugs and caps, bends, crosses, valves, and hydrant branches. Include anchorages for the following piping systems:

1. Gasketed-Joint, Ductile-Iron, Water-Service Piping: According to AWWA C600.
2. Gasketed-Joint, PVC Water-Service Piping: According to AWWA M23.
3. Fire-Service-Main Piping: According to NFPA 24.

C. Apply full coat of asphalt or other acceptable corrosion-resistant material to surfaces of installed ferrous anchorage devices.

3.7 VALVE INSTALLATION

A. AWWA Gate Valves: Comply with AWWA C600 and AWWA M44. Install each underground valve with stem pointing up and with valve box.

B. UL/FMG, Gate Valves: Comply with NFPA 24. Install each underground valve and valves in vaults with stem pointing up and with vertical cast-iron indicator post.

C. MSS Valves: Install as component of connected piping system.

D. Corporation Valves and Curb Valves: Install each underground curb valve with head pointed up and with service box.

3.8 WATER METER INSTALLATION

A. City approved contractor shall install water meters, piping according to utility City's requirements.

3.9 ROUGHING-IN FOR WATER METERS

A. Rough-in piping and specialties for water meter installation according to City's requirements.

3.10 CONCRETE VAULT INSTALLATION

A. Install precast concrete vaults according to ASTM C 891 and City's requirements.

3.11 BACKFLOW PREVENTER INSTALLATION

A. Install backflow preventers of type, size, and capacity indicated. Include valves and test cocks. Install according to requirements of plumbing and health department and authorities having jurisdiction.

B. Do not install backflow preventers that have relief drain in vault or in other spaces subject to flooding.

C. Do not install bypass piping around backflow preventers.

D. Support NPS 2-1/2 (DN 65) and larger backflow preventers, valves, and piping near floor and on brick or concrete piers.

3.12 WATER METER BOX INSTALLATION

A. Install water meter boxes in paved areas flush with surface.

B. Install water meter boxes in grass or earth areas with top 2 inches (50 mm) above surface.

3.13 CONCRETE VAULT INSTALLATION

A. Install precast concrete vaults according to ASTM C 891 and City requirements.

3.14 FIRE HYDRANT INSTALLATION

A. General: Install each fire hydrant with separate gate valve in supply pipe with concrete thrust blocking and according to City's requirements.

3.15 CONNECTIONS

A. Piping installation requirements are specified in other Division 22 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Connect water-distribution piping to utility water main. Use tapping sleeve and tapping valve.

C. Connect water-distribution piping to interior domestic water and fire-suppression piping.

D. Connect waste piping from concrete vault drains to storm-drainage system. See Division 33 Section "Storm Utility Drainage Piping" for connection to storm-sewer piping.

3.16 FIELD QUALITY CONTROL

A. Piping Tests: Conduct piping tests before joints are covered and after concrete thrust blocks have hardened sufficiently. Fill pipeline 24 hours before testing and apply test pressure to stabilize system. Use only potable water.

B. Hydrostatic Tests: Test at not less than one-and-one-half times working pressure for two hours.

1. Increase pressure in 50-psig (350-kPa) increments and inspect each joint between increments. Hold at test pressure for 1 hour; decrease to 0 psig (0 kPa). Slowly increase again to test pressure and hold for 1 more hour. Maximum allowable leakage is 2 quarts (1.89 L) per hour per 100 joints. Remake leaking joints with new materials and repeat test until leakage is within allowed limits.

C. Prepare reports of testing activities.

3.17 IDENTIFICATION

A. Install continuous underground detectable warning tape during backfilling of trench for underground water-distribution piping. Locate below finished grade, directly over piping. Underground warning tapes are specified in Division 31 Section "Earth Moving."

3.18 CLEANING

A. Clean and disinfect water-distribution piping as follows:

1. Purge new water-distribution piping systems and parts of existing systems that have been altered, extended, or repaired before use.
2. Use purging and disinfecting procedure prescribed by authorities having jurisdiction or, if method is not prescribed by authorities having jurisdiction, use procedure described in NFPA 24 for flushing of piping. Flush piping system with clean, potable water until dirty water does not appear at points of outlet.
3. Use purging and disinfecting procedure prescribed by authorities having jurisdiction or, if method is not prescribed by authorities having jurisdiction, use procedure described in AWWA C651 or do as follows:

    a. Fill system or part of system with water/chlorine solution containing at least 50 ppm of chlorine; isolate and allow to stand for 24 hours.
    b. Drain system or part of system of previous solution and refill with water/chlorine solution containing at least 200 ppm of chlorine; isolate and allow to stand for 3 hours.
    c. After standing time, flush system with clean, potable water until no chlorine remains in water coming from system.
    d. Submit water samples in sterile bottles to authorities having jurisdiction. Repeat procedure if biological examination shows evidence of contamination.

B. Prepare reports of purging and disinfecting activities.

END OF SECTION 22 11 13

SECTION 22 13 13 - FACILITY SANITARY SEWERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Pipe and fittings.
2. Nonpressure and pressure couplings.
3. Expansion joints and deflection fittings.
4. Backwater valves.
5. Cleanouts.
6. Encasement for piping.
7. Manholes.

1.3 DELIVERY, STORAGE, AND HANDLING

A. Do not store plastic manholes, pipe, and fittings in direct sunlight.

B. Protect pipe, pipe fittings, and seals from dirt and damage.

C. Handle manholes according to manufacturer's written rigging instructions.

PART 2 - PRODUCTS

2.1 DUCTILE-IRON, GRAVITY SEWER PIPE AND FITTINGS

A. Pipe: ASTM A 746, for push-on joints.

B. Standard Fittings: AWWA C110, ductile or gray iron, for push-on joints.

C. Compact Fittings: AWWA C153, ductile iron, for push-on joints.

D. Gaskets: AWWA C111, rubber.

2.2 PVC PIPE AND FITTINGS

A. PVC Type PSM Sewer Piping:

1. Pipe: ASTM D 3034, [**SDR 35**] <**Insert SDR**>, PVC Type PSM sewer pipe with bell-and-spigot ends for gasketed joints.
2. Fittings: ASTM D 3034, PVC with bell ends.
3. Gaskets: ASTM F 477, elastomeric seals.

2.3 CLEANOUTS

A. Cast-Iron Cleanouts:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

   a. Josam Company.
   b. MIFAB, Inc.
   c. Smith, Jay R. Mfg. Co.
   d. Tyler Pipe.
   e. Watts Water Technologies, Inc.
   f. Zurn Specification Drainage Operation; Zurn Plumbing Products Group.

2. Description: ASME A112.36.2M, round, gray-iron housing with clamping device and round, secured, scoriated, gray-iron cover. Include gray-iron ferrule with inside calk or spigot connection and countersunk, tapered-thread, brass closure plug.
3. Top-Loading Classification(s): Heavy Duty.
4. Sewer Pipe Fitting and Riser to Cleanout: ASTM A 74, Service class, cast-iron soil pipe and fittings.

B. PVC Cleanouts:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

   a. Canplas LLC.
   b. IPS Corporation.
   c. NDS.
   d. Plastic Oddities; a division of Diverse Corporate Technologies, Inc.
   e. Sioux Chief Manufacturing Company, Inc.
   f. Zurn Light Commercial Products Operation; Zurn Plumbing Products Group.

2. Description: PVC body with PVC threaded plug. Include PVC sewer pipe fitting and riser to cleanout of same material as sewer piping.

2.4 MANHOLES

A. Standard Precast Concrete Manholes:

1. Description: ASTM C 478 (ASTM C 478M), precast, reinforced concrete, of depth indicated, with provision for sealant joints.
2. Diameter: 48 inches (1200 mm) minimum unless otherwise indicated.
3. Ballast: Increase thickness of precast concrete sections or add concrete to base section, as required to prevent flotation.

4. Base Section: 6-inch (150-mm) minimum thickness for floor slab and 4-inch (100-mm) minimum thickness for walls and base riser section; with separate base slab or base section with integral floor.
5. Riser Sections: 4-inch (100-mm) minimum thickness, of length to provide depth indicated.
6. Top Section: Eccentric-cone type unless concentric-cone or flat-slab-top type is indicated; with top of cone of size that matches grade rings.
7. Joint Sealant: ASTM C 990 (ASTM C 990M), bitumen or butyl rubber.
8. Resilient Pipe Connectors: ASTM C 923 (ASTM C 923M), cast or fitted into manhole walls, for each pipe connection.
9. Steps: Individual FRP steps; wide enough to allow worker to place both feet on one step and designed to prevent lateral slippage off step. Cast or anchor steps into sidewalls at 12- to 16-inch (300- to 400-mm) intervals. Omit steps if total depth from floor of manhole to finished grade is less than 54 inches.
10. Adjusting Rings: Interlocking HDPE rings, with level or sloped edge in thickness and diameter matching manhole frame and cover, and with height as required to adjust manhole frame and cover to indicated elevation and slope. Include sealant recommended by ring manufacturer.
11. Grade Rings: Reinforced-concrete rings, 6- to 9-inch (150- to 225-mm) total thickness, with diameter matching manhole frame and cover, and with height as required to adjust manhole frame and cover to indicated elevation and slope.

B. Designed Precast Concrete Manholes:

1. Description: ASTM C 913; designed according to ASTM C 890 for A-16 (ASSHTO HS20-44), heavy-traffic, structural loading; of depth, shape, and dimensions indicated, with provision for sealant joints.
2. Ballast: Increase thickness of one or more precast concrete sections or add concrete to manhole as required to prevent flotation.
3. Joint Sealant: ASTM C 990 (ASTM 990M), bitumen or butyl rubber.
4. Resilient Pipe Connectors: ASTM C 923 (ASTM C 923M), cast or fitted into manhole walls, for each pipe connection.
5. Steps: Individual FRP steps; wide enough to allow worker to place both feet on one step and designed to prevent lateral slippage off step. Cast or anchor steps into sidewalls at 12- to 16-inch (300- to 400-mm) intervals. Omit steps if total depth from floor of manhole to finished grade is less than 54 inches.
6. Adjusting Rings: Interlocking HDPE rings, with level or sloped edge in thickness and diameter matching manhole frame and cover, and with height as required to adjust manhole frame and cover to indicated elevation and slope. Include sealant recommended by ring manufacturer.
7. Grade Rings: Reinforced-concrete rings, 6- to 9-inch (150- to 225-mm) total thickness, with diameter matching manhole frame and cover, and with height as required to adjust manhole frame and cover to indicated elevation and slope.

C. Manhole Frames and Covers:

1. Description: Ferrous; 24-inch (610-mm) ID by 7- to 9-inch (175- to 225-mm) riser, with 4-inch- (100-mm-) minimum-width flange and 26-inch- (660-mm-) diameter cover. Include indented top design with lettering cast into cover, using wording equivalent to "SANITARY SEWER."
2. Material: ASTM A 536, Grade 60-40-18 ductile iron unless otherwise indicated.

2.5 CONCRETE

A. General: Cast-in-place concrete complying with ACI 318, ACI 350/350R (ACI 350M/350RM), and the following:

1. Cement: ASTM C 150, Type II.
2. Fine Aggregate: ASTM C 33, sand.
3. Coarse Aggregate: ASTM C 33, crushed gravel.
4. Water: Potable.

B. Portland Cement Design Mix: 4000 psi (27.6 MPa) minimum, with 0.45 maximum water/cementitious materials ratio.

1. Reinforcing Fabric: ASTM A 185/A 185M, steel, welded wire fabric, plain.
2. Reinforcing Bars: ASTM A 615/A 615M, Grade 60 (420 MPa) deformed steel.

C. Manhole Channels and Benches: Factory or field formed from concrete. Portland cement design mix, 4000 psi (27.6 MPa) minimum, with 0.45 maximum water/cementitious materials ratio. Include channels and benches in manholes.

1. Channels: Concrete invert, formed to same width as connected piping, with height of vertical sides to three-fourths of pipe diameter. Form curved channels with smooth, uniform radius and slope.

a. Invert Slope: As indicated by invert elevations.

D. Ballast and Pipe Supports: Portland cement design mix, 3000 psi (20.7 MPa) minimum, with 0.58 maximum water/cementitious materials ratio.

1. Reinforcing Fabric: ASTM A 185/A 185M, steel, welded wire fabric, plain.
2. Reinforcing Bars: ASTM A 615/A 615M, Grade 60 (420 MPa) deformed steel.

PART 3 - EXECUTION

3.1 EARTHWORK

A. Excavating, trenching, and backfilling are specified in Section 312000 "Earth Moving."

3.2 PIPING INSTALLATION

A. General Locations and Arrangements: Drawing plans and details indicate general location and arrangement of underground sanitary sewer piping. Location and arrangement of piping layout take into account design considerations. Install piping as indicated, to extent practical. Where specific installation is not indicated, follow piping manufacturer's written instructions.

B. Install piping beginning at low point, true to grades and alignment indicated with unbroken continuity of invert. Place bell ends of piping facing upstream. Install gaskets, seals, sleeves, and couplings according to manufacturer's written instructions for using lubricants, cements, and other installation requirements.

C. Install manholes for changes in direction unless fittings are indicated. Use fittings for branch connections unless direct tap into existing sewer is indicated.

D. Install proper size increasers, reducers, and couplings where different sizes or materials of pipes and fittings are connected. Reducing size of piping in direction of flow is prohibited.

E. When installing pipe under streets or other obstructions that cannot be disturbed, use pipe-jacking process of microtunneling.

F. Install gravity-flow, nonpressure, drainage piping according to the following:

1. Install piping pitched down in direction of flow, at minimum slope of 1 percent unless otherwise indicated.
2. Install ductile-iron, gravity sewer piping according to ASTM A 746.
3. Install PVC Type PSM sewer piping according to ASTM D 2321 and ASTM F 1668.

G. Clear interior of piping and manholes of dirt and superfluous material as work progresses. Maintain swab or drag in piping, and pull past each joint as it is completed. Place plug in end of incomplete piping at end of day and when work stops.

3.3 PIPE JOINT CONSTRUCTION

A. Join gravity-flow, nonpressure, drainage piping according to the following:

1. Join ductile-iron, gravity sewer piping according to AWWA C600 for push-on joints.
2. Join PVC Type PSM sewer piping according to ASTM D 2321 and ASTM D 3034 for elastomeric-seal joints or ASTM D 3034 for elastomeric-gasket joints.

3.4 MANHOLE INSTALLATION

A. General: Install manholes complete with appurtenances and accessories indicated.

B. Install precast concrete manhole sections with sealants according to ASTM C 891.

C. Form continuous concrete channels and benches between inlets and outlet.

D. Set tops of frames and covers flush with finished surface of manholes that occur in pavements. Set tops 3 inches above finished surface elsewhere unless otherwise indicated.

3.5 CONCRETE PLACEMENT

A. Place cast-in-place concrete according to ACI 318.

3.6 CLEANOUT INSTALLATION

A. Install cleanouts and riser extensions from sewer pipes to cleanouts at grade. Use cast-iron soil pipe fittings in sewer pipes at branches for cleanouts, and use cast-iron soil pipe for riser extensions to cleanouts. Install piping so cleanouts open in direction of flow in sewer pipe.

1. Use Light-Duty, top-loading classification cleanouts in earth or unpaved foot-traffic areas.

2. Use Medium-Duty, top-loading classification cleanouts in paved foot-traffic areas.
3. Use Heavy-Duty, top-loading classification cleanouts in vehicle-traffic service areas.

B. Set cleanout frames and covers in earth in cast-in-place-concrete block, 18 by 18 by 12 inches (450 by 450 by 300 mm) deep. Set with tops 1 inch (25 mm) above surrounding grade.

C. Set cleanout frames and covers in concrete pavement and roads with tops flush with pavement surface.

3.7 CONNECTIONS

A. Connect nonpressure, gravity-flow drainage piping to building's sanitary building drains.

B. Make connections to existing piping and underground manholes.

1. Use commercially manufactured wye fittings for piping branch connections. Remove section of existing pipe, install wye fitting into existing piping, and encase entire wye fitting plus 6-inch (150-mm) overlap with not less than 6 inches (150 mm) of concrete with 28-day compressive strength of 3000 psi (20.7 MPa).
2. Make branch connections from side into existing piping, NPS 4 to NPS 20 (DN 100 to DN 500). Remove section of existing pipe, install wye fitting into existing piping, and encase entire wye with not less than 6 inches (150 mm) of concrete with 28-day compressive strength of 3000 psi (20.7 MPa).
3. Make branch connections from side into existing piping, NPS 21 (DN 525) or larger, or to underground manholes by cutting opening into existing unit large enough to allow 3 inches (76 mm) of concrete to be packed around entering connection. Cut end of connection pipe passing through pipe or structure wall to conform to shape of and be flush with inside wall unless otherwise indicated. On outside of pipe or manhole wall, encase entering connection in 6 inches (150 mm) of concrete for minimum length of 12 inches (300 mm) to provide additional support of collar from connection to undisturbed ground.

   a. Use concrete that will attain a minimum 28-day compressive strength of 3000 psi (20.7 MPa) unless otherwise indicated.
   b. Use epoxy-bonding compound as interface between new and existing concrete and piping materials.

4. Protect existing piping and manholes to prevent concrete or debris from entering while making tap connections. Remove debris or other extraneous material that may accumulate.

C. Connect to grease interceptors specified in Section 221323 "Sanitary Waste Interceptors."

3.8 IDENTIFICATION

A. Comply with requirements in Section 31200 "Earth Moving" for underground utility identification devices. Arrange for installation of green warning tapes directly over piping and at outside edges of underground manholes.

1. Use warning tape or detectable warning tape over ferrous piping.
2. Use detectable warning tape over nonferrous piping and over edges of underground manholes.

3.9 FIELD QUALITY CONTROL

A. Inspect interior of piping to determine whether line displacement or other damage has occurred. Inspect after approximately 24 inches (600 mm) of backfill is in place, and again at completion of Project.

1. Submit separate report for each system inspection.
2. Defects requiring correction include the following:

   a. Alignment: Less than full diameter of inside of pipe is visible between structures.
   b. Deflection: Flexible piping with deflection that prevents passage of ball or cylinder of size not less than 92.5 percent of piping diameter.
   c. Damage: Crushed, broken, cracked, or otherwise damaged piping.
   d. Infiltration: Water leakage into piping.
   e. Exfiltration: Water leakage from or around piping.

3. Replace defective piping using new materials, and repeat inspections until defects are within allowances specified.
4. Reinspect and repeat procedure until results are satisfactory.

B. Test new piping systems, and parts of existing systems that have been altered, extended, or repaired, for leaks and defects.

1. Do not enclose, cover, or put into service before inspection and approval.
2. Test completed piping systems according to requirements of authorities having jurisdiction.
3. Schedule tests and inspections by authorities having jurisdiction with at least 24 hours' advance notice.
4. Submit separate report for each test.
5. Hydrostatic Tests: Test sanitary sewerage according to requirements of authorities having jurisdiction and the following:

   a. Fill sewer piping with water. Test with pressure of at least 10-foot (3-m) head of water, and maintain such pressure without leakage for at least 15 minutes.
   b. Close openings in system and fill with water.
   c. Purge air and refill with water.
   d. Disconnect water supply.
   e. Test and inspect joints for leaks.

6. Air Tests: Test sanitary sewerage according to requirements of authorities having jurisdiction, UNI-B-6, and the following:

   a. Option: Test plastic gravity sewer piping according to ASTM F 1417.
   b. Option: Test concrete gravity sewer piping according to ASTM C 924 (ASTM C 924M).

7. Manholes: Perform hydraulic test according to ASTM C 969 (ASTM C 969M).

C. Leaks and loss in test pressure constitute defects that must be repaired.

D. Replace leaking piping using new materials, and repeat testing until leakage is within allowances specified.

3.10 CLEANING

A. Clean dirt and superfluous material from interior of piping.

END OF SECTION 22 13 13

SECTION 22 13 23 - SANITARY WASTE INTERCEPTORS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Grease interceptors.

1.2 SUBMITTALS

A. Product Data: For each type of metal interceptor indicated.

B. Shop Drawings: For each type and size of precast-concrete interceptor indicated.

PART 2 - PRODUCTS

2.1 GREASE INTERCEPTORS

A. Grease Interceptors: Precast concrete complying with ASTM C 913.

1. Include rubber-gasketed joints, vent connections, manholes, compartments or baffles, and piping or openings to retain grease and to permit wastewater flow.
2. Structural Design Loads:

   a. Light-Traffic Load: Comply with ASTM C 890, A-8 (ASSHTO HS10-44).
   b. Medium-Traffic Load: Comply with ASTM C 890, A-12 (ASSHTO HS15-44).
   c. Heavy-Traffic Load: Comply with ASTM C 890, A-16 (ASSHTO HS20-44).
   d. Walkway Load: Comply with ASTM C 890, A-03.

3. Resilient Pipe Connectors: ASTM C 923 (ASTM C 923M), cast or fitted into interceptor walls, for each pipe connection.
4. Steps: Individual FRP steps or FRP ladder, wide enough to allow worker to place both feet on one step and designed to prevent lateral slippage off step. Cast or anchor steps into sidewalls at 12- to 16-inch (300- to 400-mm) intervals. Omit steps if total depth from floor of interceptor to finished grade is less than 60 inches (1500 mm).
5. Grade Rings: Reinforced-concrete rings, 6- to 9-inch (150- to 225-mm) total thickness, to match diameter of manhole frame and cover.
6. Manhole Frames and Covers: Ferrous; 24-inch (610-mm) ID by 7- to 9-inch (175- to 225-mm) riser with 4-inch- (100-mm-) minimum width flange and 26-inch- (660-mm-) diameter cover.

   a. Ductile Iron: ASTM A 536, Grade 60-40-18, unless otherwise indicated.
   b. Gray Iron: ASTM A 48, Class 35, unless otherwise indicated.
   c. Include indented top design with lettering cast into cover, using wording equivalent to " GREASE INTERCEPTOR."

B. Capacities and Characteristics – See Drawings.

2.2 PRECAST-CONCRETE MANHOLE RISERS

A. Precast-Concrete Manhole Risers: ASTM C 478 (ASTM C 478M), with rubber-gasket joints.

1. Structural Design Loads:

a. Light-Traffic Load: Comply with ASTM C 890, A-8 (ASSHTO HS10-44).
b. Medium-Traffic Load: Comply with ASTM C 890, A-12 (ASSHTO HS15-44).
c. Heavy-Traffic Load: Comply with ASTM C 890, A-16 (ASSHTO HS20-44).
d. Walkway Load: Comply with ASTM C 890, A-03.

2. Length: From top of underground concrete structure to grade.
3. Riser Sections: 3-inch (75-mm) minimum thickness and 36-inch (915-mm) diameter.
4. Top Section: Eccentric cone, unless otherwise indicated. Include top of cone to match grade ring size.
5. Gaskets: ASTM C 443 (ASTM C 443M), rubber.
6. Steps: Individual FRP steps or FRP ladder, wide enough to allow worker to place both feet on one step and designed to prevent lateral slippage off step. Cast or anchor steps into sidewalls at 12- to 16-inch (300- to 400-mm) intervals.

B. Grade Rings: Reinforced-concrete rings, 6- to 9-inch (150- to 225-mm) total thickness, diameter matching manhole frame and cover, and height as required to adjust the manhole frame and cover to indicated elevation and slope.

C. Manhole Frames and Covers: Ferrous; 24-inch (610-mm) ID by 7- to 9-inch (175- to 225-mm) riser with 4-inch- (100-mm-) minimum width flange and 26-inch- (660-mm-) diameter cover.

1. Ductile Iron: ASTM A 536, Grade 60-40-18, unless otherwise indicated.
2. Gray Iron: ASTM A 48, Class 35, unless otherwise indicated.
3. Include indented top design with lettering cast into cover, using wording equivalent to the following:

a. Grease Interceptors in Sanitary Sewerage System: "INTERCEPTOR."

PART 3 - EXECUTION

3.1 EARTHWORK

A. Excavating, trenching, and backfilling are specified in Division 31 Section "Earth Moving."

3.2 INSTALLATION

A. Install precast-concrete interceptors according to ASTM C 891. Set level and plumb.

B. Install manhole risers from top of underground concrete interceptors to manholes and gratings at finished grade.

C. Set tops of manhole frames and covers flush with finished surface in pavements. Set tops 3 inches (75 mm) above finish surface elsewhere, unless otherwise indicated.

D. Set metal interceptors level and plumb.

E. Set tops of metal interceptor covers flush with finished surface in pavements. Set tops 3 inches (75 mm) above finish surface elsewhere, unless otherwise indicated.

F. Install piping and oil storage tanks according to Division 23 Section "Facility Fuel-Oil Piping."

3.3 CONNECTIONS

A. Piping installation requirements are specified in other Division 22 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Make piping connections between interceptors and piping systems.

3.4 IDENTIFICATION

A. Identification materials and installation are specified in Division 31 Section "Earth Moving." Arrange for installation of green warning tapes directly over piping and at outside edges of underground interceptors.

1. Use warning tapes or detectable warning tape over ferrous piping.
2. Use detectable warning tape over nonferrous piping and over edges of underground structures.

END OF SECTION 22 13 23

DIVISION 31 - EARTHWORK

SECTION 31 10 00 - SITE CLEARING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Protection of existing trees and vegetation to remain.
2. Removal of surface debris.
3. Grubbing.
4. Removal of sod and grassing.
5. Removal of indicated pavements and other above-grade improvements.
6. Removal of indicated below-grade improvements.

1.3 LEED BUILDING GENERAL REQUIREMENTS

A. The University of South Carolina requires the Contractor to implement practices and procedures to meet the project's environmental performances goals, which include achieving LEED Certification. Specific project goals that may impact this area of work include: use of recycled-content materials; use of locally-manufactured materials; use of low-emitting materials; construction waste recycling; and the implementation of a construction indoor air quality management plan. The Contractor shall ensure that the requirements related to these goals, as defined in the sections below, are implemented to the fullest extent. Substitutions shall not be allowed if such changes comprise the stated LEED BUILDING Performance Criteria.

1.4 MATERIALS OWNERSHIP

A. Except for materials indicated to be stockpiled or to remain Owner's property, cleared materials shall become Contractor's property and shall be removed from the site.

1.5 SUBMITTALS

A. Photographs or videotape, sufficiently detailed, of existing conditions of trees and plantings, adjoining construction, and site improvements that might be misconstrued as damage caused by site clearing.

B. Record drawings according to Division 1 Specification Sections.

1. Identify and accurately locate capped utilities and other subsurface structural, electrical, and mechanical conditions which will remain.

1.6 QUALITY ASSURANCE

A. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 1 Specification Sections.

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

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

1.7 REGULATORY REQUIREMENTS

A. Conform to applicable regulations relating to environmental requirements, disposal of debris, burning debris on-site, use of herbicides, and City of Columbia requirements for sedimentation and erosion control.

B. Coordinate clearing work with utility companies.

1.8 PROJECT CONDITIONS

A. Traffic: Minimize interference with adjoining roads, streets, walks, and other adjacent occupied or used facilities during site-clearing operations.

1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction.
2. Provide alternate routes around closed or obstructed traffic ways if required by authorities having jurisdiction.

B. Protection of Existing Improvements: Provide protections necessary to prevent damage to existing improvements indicated to remain in place.

1. DO NOT BEGIN TRENCH/PIT EXCAVATION BEFORE CALLING 'PALMETTO UTILITY PROTECTION SERVICE' AT 1-800-922-0983. Call 72-hours before any planned excavation activities. Utilities within Public Properties or Easements will be located by P.U.P.S. Failure to notify P.U.P.S. will result in the Contractor being liable for any repairs to utilities that are damaged.
2. Protect existing improvements and utilities on adjoining properties and on the Owner's property.
3. Restore damaged improvements or utilities to their original conditions, as acceptable to the property owner.

C. Protection of Existing Trees and Vegetation: Protect existing trees and other vegetation indicated to remain in place, against unnecessary cutting, breaking or skinning or roots, skinning or bruising of bark, smothering of trees by stockpiling construction materials or excavated materials within the drip line, excess foot or vehicular traffic, or parking of vehicles with the drip line or any acts which may be harmful to the continued growth of the trees to be protected. Provide temporary guards to protect trees and vegetation to be left standing. For the purposes of tree protection, the drip line is defined as 1-1/2 times the diameter of the tree measured 4-feet above existing grade.

1. Water trees and other vegetation to remain within the limits of contract work as required to maintain their health during the course of construction operations.
2. Provide protection for roots over 1-1/2 inches in diameter that are cut during construction operations. Temporarily cover exposed roots with wet burlap to prevent roots from drying out; cover with earth as soon as possible or cut off cleanly below grade.
3. Repair or replace trees and vegetation indicated to remain that are damaged by construction operations, in a manner acceptable to the Architect/Engineer. Employ a licensed arborist to repair damages to trees and shrubs. All tree work shall be done in accordance with the most recent revision of the International Society of Arboriculture practices.
4. Replace trees that cannot be repaired and restore to full-growth status, as determined by arborist.

    a. If a tree identified to remain is damaged, remove tree and replace with a tree of the same or similar species, 2-inch caliper or larger, from balled and burlapped nursery stock when construction activities in the vicinity are completed.

D. Install tree protection barrier where indicated on the plans using metal tee for posts and orange construction fence, spacing posts no less than 8-feet on center. Height to be a minimum of 3-feet above grade.

1. Place tree protection fencing in a manner to prevent the approach of equipment within the drip line of trees to remain.

E. Improvements on Adjoining Property: Authority for performing indicated removal and alteration work on property adjoining Owner's property will be obtained by Owner before award of Contract.

F. Salvable Improvements: Carefully remove items indicated to be salvaged and store on Owner's premises where indicated.

G. Notify utility locator service for area where Project is located before site clearing.

PART 2 - PRODUCTS

2.1 SOIL MATERIALS

A. Satisfactory Soil Materials: Requirements for satisfactory soil materials are specified in Section 312000 – Earth Moving.

1. Obtain approved borrow soil materials off-site when satisfactory soil materials are not available on-site.

2.2 ACCESSORIES

A. Herbicide: Contractor's choice of legal and appropriate chemical formulation for selective weed control for the specific season of year as approved by applicable regulatory agency.

B. Tree Wound Paint: Bituminous based paint of standard manufacture specifically formulated for tree wounds.

PART 3 - EXECUTION

3.1 PREPARATION

A. Locate and identify utilities to remain.

B. Protect and maintain benchmarks and survey control points from disturbance during construction.

C. Provide erosion-control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways.

D. Locate and clearly flag trees and vegetation to remain.

E. Protect existing site improvements to remain from damage during construction.

1. Restore damaged improvements to their original condition, as acceptable to Owner.

F. Identify a temporary storage area for placing removed materials.

3.2 UTILITIES

A. Locate, identify, disconnect, and seal or cap off utilities indicated to be removed.

1. Owner will arrange to shut off indicated utilities when requested by Contractor.
2. Arrange to shut off indicated utilities with utility companies.

B. Existing Utilities: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:

1. Notify Architect/Engineer not less than two days in advance of proposed utility interruptions.
2. Do not proceed with utility interruptions without Architect/Engineer's written permission.

3.3 CLEARING AND GRUBBING

A. Remove obstructions, grass, and other vegetation as indicated and to permit installation of new construction.

1. Do not remove trees, shrubs, and other vegetation indicated to remain.
2. Cut minor roots and branches of trees indicated to remain in a clean and careful manner where such roots and branches obstruct installation of new construction.
3. Completely remove surface rock, stumps, roots, obstructions, and debris extending to a depth of 18-inches below exposed subgrade.

   a. Remove roots 1-1/2 inches or smaller.
   b. Clear undergrowth and deadwood without disturbing topsoil.

c. Apply herbicide to remaining stumps to inhibit growth.

4. Use only hand methods for grubbing within drip line of remaining trees.
5. Remove existing sod and grassing without disturbing topsoil.

B. Fill depressions caused by clearing and grubbing operations with satisfactory soil material, unless further excavation or earthwork is indicated.

1. Place fill material in horizontal layers not exceeding 6-inch loose depth, and compact each layer to a density equal to adjacent original ground.

C. Selective Clearing:

1. Shall be performed in areas designated by Architect/Engineer.
2. Selective clearing shall consist of remove all vegetation, brush, stumps, etc. within the designated area. Grubbing will not be required within these areas. Grub areas, as directed, using by-hand methods only.
3. Selected trees shall be left standing and care shall be taken not to damage remaining trees.

D. Tree Pruning: Where existing trees are to remain, and branches encroach with the areas of new construction, prune individual trees as necessary.

1. Trim trees designated to remain of dead branches of 1-1/2 inches in diameter or greater.
2. Neatly cut limbs and branches to be trimmed close to the bole of the tree or main branch.
3. Paint cuts greater than 1-1/4 inches in diameter with approved tree wound paint.

3.4 TOPSOIL STRIPPING

A. Topsoil: Natural or cultivated surface-soil layer containing organic matter and sand, silt, and clay particles; friable, pervious, and black or a darker shade of brown, gray, or red than underlying subsoil; reasonably free of subsoil, clay lumps, gravel, and other objects more than 2-inches in diameter; and free of weeds, roots, and other deleterious materials.

B. See Section 312000 – Earth Moving.

3.5 SITE IMPROVEMENTS

A. Remove existing above- and below-grade improvements as indicated and as necessary to facilitate new construction.

B. Remove portions of slabs, pavements, curbs, gutters, aggregate bases, and other above-grade improvements as indicated.

1. Unless existing full-depth joints coincide with line of demolition, neatly saw-cut length of existing pavement to remain before removing existing pavement. Saw-cut faces vertically.

3.6 DISPOSAL

A. Disposal: Remove surplus soil material, unsuitable topsoil, obstructions, demolished materials, and waste materials, including trash and debris, and legally dispose of them off Owner's property.

B. Burning on Owner's Property: Burning is NOT permitted on the Owner's Property.

END OF SECTION 31 10 00

SECTION 31 20 00 – EARTH MOVING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Topsoil stripping, stockpiling, respreading, and removal.
2. Rough Grading and preparing subgrades for slabs-on-grade, walks, pavements, lawns, and plantings.
3. Finish Grading for slabs-on-grade, walks, pavements, lawns, and plantings.
4. Dressing of shoulders and banks.

1.3 LEED BUILDING GENERAL REQUIREMENTS

A. The University of South Carolina requires the Contractor to implement practices and procedures to meet the project's environmental performances goals, which include achieving LEED Certification. Specific project goals that may impact this area of work include: use of recycled-content materials; use of locally-manufactured materials; use of low-emitting materials; construction waste recycling; and the implementation of a construction indoor air quality management plan. The Contractor shall ensure that the requirements related to these goals, as defined in the sections below, are implemented to the fullest extent. Substitutions shall not be allowed if such changes comprise the stated LEED BUILDING Performance Criteria.

1.4 REFERENCES

A. ANSI/ASTM D698 – Test Methods for Moisture-Density Relations of Soil and Soil-Aggregate Mixtures, using 5.5 lbs. Rammer and 12-inch drop.

B. ANSI/ASTM D1556 – Test Method for Density of Soil in Place by Sand-Cone Method.

C. SCDOT – Standard Specifications for Highway Construction, South Carolina Department of Transportation; 2007 Edition.

1.5 DEFINITIONS

A. Backfill: Soil materials used to fill an excavation.

1. Initial Backfill: Backfill placed beside and over pipe in a trench, including haunches to support sides of pipe.
2. Final Backfill: Backfill placed over initial backfill to fill a trench.

B. Base Course: Layer placed between the subbase course and asphalt paving.

C. Bedding Course: Layer placed over the excavated subgrade in a trench before laying pipe.

D. Borrow: Satisfactory soil imported from off-site for use as fill or backfill.

E. Drainage Course: Layer supporting slab-on-grade used to minimize capillary flow of pore water.

F. Excavation: Removal of material encountered above subgrade elevations indicated.

1. Unauthorized Excavations: Removal of materials beyond indicated subgrade elevations or dimensions without specific direction from the Architect/Engineer. Unauthorized excavation, as well as remedial work directed by Architect/Engineer, shall be at the Contractor's expense.
2. Additional Excavations: Excavation below subgrade elevations as directed by the Architect/Engineer.

   a. When excavations have reached required subgrade elevations, notify the Architect/Engineer and Testing Agency, who will make an inspection of conditions. If the Architect/Engineer and Testing Agency determine that bearing materials at required subgrade elevations are unsuitable, continue excavation until suitable bearing materials are encountered and replace excavated materials by the Architect/Engineer and Geotechnical Engineer.
   b. The Contract Sum may be adjusted by an appropriate Contract Modification.
      1) Removal of unsuitable material and its replacement, as directed, will be paid on basis of Conditions of Contract relative to changes in Work. Notify the Architect/Engineer prior to removal of any unsuitable materials.

3. Muck: Materials unsuitable of carrying loads due to high organic content or saturation to the extent that it is somewhat fluid and must be removed by dragline, dredge or other special equipment, are designated as Muck.

4. Bulk Excavation: Excavations more than 10-feet in width and pits more than 30-feet in either length or width.

G. Fill: Soil materials used to raise to subgrade elevations indicated.

H. Rock: Rock material in beds, ledges, unstratified masses, and conglomerate deposits and boulders of rock material exceeding 1-c.y. for bulk excavation or ¾-c.y. for trench and pit excavation that cannot be removed by rock excavating equipment equivalent to the following in size and performance ratings, without systematic drilling, ram hammering, ripping, or blasting, when permitted:

1. Excavation of Trenches and Pits: Late-model, track-mounted hydraulic excavator; equipped with a 42-inch-wide, short-tip-radius rock bucket; rated at not less than 120-hp flywheel power with bucket-curling force of not less than 25,000 lbs. and stick-crowd force of not less than 18,700 lbs.; measured according to SAE J-1179.
2. Bulk Excavation: Late-model, track-mounted loader; rated at not less than 210-hp flywheel power and developing a minimum of 45,000-lbs. breakout force; measured according to SAE J-732.

I. Structures: Buildings, foundations, retaining walls, slabs, tanks, curbs, mechanical and electrical appurtenances, or other man-made stationary features constructed above or below the ground surface.

J. Subbase Course: Layer placed between the subgrade and base course for asphalt paving, or layer placed between the subgrade and a concrete pavement or walk.

K. Subgrade: Surface or elevation remaining after completing excavation, or top surface of a fill or backfill immediately below subbase, drainage fill, or topsoil materials.

L. Topsoil: Natural or cultivated surface-soil layer containing organic matter and sand, silt, and clay particles; friable, pervious, and black or a darker shade of brown, gray, or red than underlying subsoil; reasonably free of subsoil, clay lumps, gravel, and other objects more than 2-inches in diameter; and free of weeds, roots, and other deleterious materials.

M. Utilities include on-site underground pipes, conduits, ducts, and cables, as well as underground services within buildings.

1.6 SUBMITTALS

A. Product Data: For the following:

1. Each type of plastic warning tape.
2. Drainage fabric.
3. Separation fabric.

B. Material Test Reports: From a qualified testing agency indicating and interpreting test results for compliance of the following with requirements indicated:

1. Classification according to ASTM D2487 of each on-site or borrow soil material proposed for fill and backfill.
2. Laboratory compaction curves according to ASTM D698 for each on-site or borrow soil material proposed for fill and backfill.
3. Laboratory compaction curves according to ASTM D1557 for each on-site or borrow soil material proposed for fill and backfill.

C. Project Record Documents: Accurately record actual locations and make as as-built drawing of all utilities remaining by horizontal dimensions, elevations or inverts, and slope gradients.

1.7 QUALITY ASSURANCE

A. Codes and Standards: Perform excavation work in compliance with applicable requirements of authorities having jurisdiction.

B. Perform Work in accordance with State of South Carolina Highway Department Standard Specifications.

1. Maintain one copy on site.

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

D. Geotechnical Testing and Inspection Service: The Owner will employ and pay for a qualified independent Geotechnical Testing Agency to perform soil testing and inspection services during earthwork operations. The Contractor shall schedule his work in such a manner to permit a

reasonable amount of time for testing to be performed before placing succeeding lifts of fill material and shall keep the Testing Agency informed of all progress.

1. The Owner shall pay for the cost of initial testing, subsequent tests, which are required as a result of a test failure, shall be paid for by the Contractor.

E. Geotechnical Testing Agency Qualifications: An independent testing agency qualified according to ASTM E329 to conduct soil materials and rock-definition testing, as documented according to ASTM D3740 and ASTM E548.

F. Use of Explosives: Use of explosives is NOT permitted on the Owner's property.

G. Pre-Excavation Conference: Conduct conference at Project site to comply with requirements in Division 1 Specification Sections.

1.8 PROJECT CONDITIONS

A. Existing Utilities: Locate existing underground utilities in areas of excavation work. If utilities are indicated to remain in place, provide adequate means of support and protection during earthwork operations.

1. DO NOT BEGIN ANY TRENCH/PIT EXCAVATION BEFORE CALLING 'PALMETTO UTILITY PROTECTION SERVICE' AT 1-800-922-0983. Call 72-Hours before any planned excavation activities. Utilities within Public Properties and Easements will be located by P.U.P.S. Failure to notify P.U.P.S., will result in the Contractor being liable for any repairs to utilities which are damaged.
2. In the event uncharted, or incorrectly charted, piping or other utilities are encountered during excavation, consult utility owner immediately for directions. Cooperate with the Owner and utility companies in keeping respective services in operations. Repair damaged utilities to the satisfaction of the utility owner.
3. Do not interrupt existing utilities serving facilities occupied by the Owner or others, during occupied hours, except when permitted in writing by the Architect/Engineer and then only after acceptable temporary utilities have been provided.
4. Provide a minimum of 48-hours notice to the Architect/Engineer, and receive written notice to proceed before interrupting any utility.

B. Protection of Persons and Property: Barricade open excavations occurring as part of this work and post with warning lights.

1. Operate warning lights as recommended by authorities having jurisdiction.
2. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earthwork operations.
3. Perform excavation by hand within drip line of large trees to remain. Protect root systems from damage or dry-out to the greatest extent possible. Maintain moist conditions for root system and cover exposed roots with moistened burlap.

C. Dust Control: Use means necessary to prevent dust from becoming a nuisance to the public, to neighbors, and to others working on or near the site.

D. Protect plants, lawns, rock outcroppings, and other features to remain as a portion of final landscaping.

E. Protect benchmarks, survey control points, existing structures, fences, sidewalks, pavements, curbs, gutters, and other structures from excavation equipment and vehicular traffic.

PART 2 - PRODUCTS

2.1 SOIL MATERIALS

A. General: Soil materials used as fill, backfill, subgrades for structures or pavements, embankments, or grading shall consist of suitable materials as found available on site until such supply of on-site material is depleted.

1. Provide suitable materials free of organic matter and deleterious substances, containing no rocks or lumps over 6-inches in the largest dimension, and with not more than 15% of rocks or lumps larger than 2-1/2 inches in the greatest dimension.
2. Do not permit rocks having a dimension greater than 1-inch in the upper 6-inches of fill or embankment.

B. In the event that the quantity of suitable on-site materials is insufficient to complete the Work, suitable borrow materials, as approved by the Architect/Engineer, shall be provided by the Contractor at no additional expense to the Owner.

C. Satisfactory Soils: ASTM D2487 soil classification groups CL, GW, GP, GM, ML, SC, SM, and SW, or a combination of these group symbols; Graded, free of debris, waste, frozen materials, vegetation, and other deleterious matter.

D. Unsatisfactory Soils: ASTM D2487 soil classification groups CH, GC, ML, MH, SP, OL, OH, and PT, or a combination of these group symbols. All highly organic soils will be considered unsuitable.

1. Excess water in soil materials will cause soil to be determined unsuitable regardless of normal classification. Unsatisfactory soils also include satisfactory soils not maintained within 2-percent of optimum moisture content at time of compaction.
2. The acceptability of composite sand-clay, sand-silt, and silt-clay soils will be determined by the Geotechnical Engineer.

E. Subsoil Materials: Excavated material, graded free of lumps larger than 6-inches and rocks larger than 3-inches and debris.

F. Backfill and Fill Materials: Satisfactory soil materials free of clay, rock or gravel larger than 2-inches in any dimension, debris, waste, frozen materials, vegetation and other deleterious matter.

G. Subbase: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D2940; with at least 90-percent passing a 1-1/2-inch sieve and not more than 12-percent passing a No. 200 sieve.

1. See Section 027210 – Aggregate Base Course, for additional information.

H. Base: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D2940; with at least 95-percent passing a 1-1/2-inch sieve and not more than 8-percent passing a No. 200 sieve.

1. See Section 027210 – Aggregate Base Course, for additional information.

I. Bedding: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D2940; except with 100-percent passing a 1-inch sieve and not more than 8-percent passing a No. 200 sieve.

J. Drainage Fill: Washed, narrowly graded mixture of crushed stone, or crushed or uncrushed gravel; ASTM D448; coarse-aggregate grading Size 57; with 100-percent passing a 1-1/2- inch sieve and 0 to 5-percent passing a No. 8 sieve.

1. See Section 027210 – Aggregate Base Course, for additional information.

K. Filter Material: Narrowly graded mixture of natural or crushed gravel, or crushed stone and natural sand; ASTM D448; coarse-aggregate grading Size 67; with 100-percent passing a 1-inch sieve and 0 to 5-percent passing a No. 4 sieve.

1. See Section 027210 – Aggregate Base Course, for additional information.

2.2 ACCESSORIES

A. Warning Tape: Acid- and alkali-resistant polyethylene film warning tape manufactured for marking and identifying underground utilities, 6-inches wide and 4-mils thick, continuously inscribed with a description of the utility; colored as follows:

B. Detectable Warning Tape: Acid- and alkali-resistant polyethylene film warning tape manufactured for marking and identifying underground utilities, minimum 6-inches wide and 4-mils thick, continuously inscribed with a description of utility, with metallic core encased in a protective jacket for corrosion protection, detectable by metal detector when tape is buried up to 30-inches deep; colored as follows:

1. Red: Electric.
2. Yellow: Gas, oil, steam, and dangerous materials.
3. Orange: Telephone and other communications.
4. Blue: Water systems.
5. Green: Sanitary and Storm Sewer systems.

C. Filter Fabric: Nonwoven geotextile, specifically manufactured as a drainage geotextile; made from polyolefins, polyesters, or polyamides; and with the following minimum properties determined according to SCDOT Standard Specifications Section 804.11 (2007), ASTM D4759, and referenced standard test methods:

1. Grab Tensile Strength: 90 lbs.; ASTM D4632.
2. Tear Strength: 40 lbs.; ASTM D4533.
3. Puncture Resistance: 40 lbs.; ASTM D4833.
4. Water Flow Rate: 150 gpm per sq. ft.; ASTM D4491.
5. Apparent Opening Size: No. 50; ASTM D4751.
6. Acceptable Products:

   a. AMOCO Fabrics and Fibers Co.
   b. Mirafi, Inc.
   c. Reemay Inc., Typar Geotextile Fabric.
   d. Or equal.

D. Separation Fabric: Woven geotextile, specifically manufactured for use as a separation geotextile; made from polyolefins, polyesters, or polyamides; and with the following minimum properties

determined according to SCDOT Standard Specifications Section 804.11 (2007), ASTM D4759, and referenced standard test methods:

1. Grab Tensile Strength: 200 lbs.; ASTM D4632.
2. Tear Strength: 80 lbs.; ASTM D4533.
3. Puncture Resistance: 80 lbs.; ASTM D4833.
4. Water Flow Rate: 4 gpm per sq. ft.; ASTM D4491.
5. Apparent Opening Size: No. 30; ASTM D4751.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that survey benchmarks, existing grades and contours, and intended elevations for the Work are as indicated.

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

C. All site preparation work, topsoil and subsoil excavation, and filling work shall be performed in strict accordance with this specification and in accordance with the subsurface investigation report. The strictest requirements shall apply if discrepancies occur.

3.2 PREPARATION

A. Verify that grubbing operations are completed before commencing the Work of this Section.

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

C. Identify required lines, levels, contours, and datum.

D. Stake and flag locations of known utilities.

E. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earthwork operations.

F. Protect plant life, lawns, and other features remaining as a portion of final landscaping.

G. Protect subgrades and foundation soils against freezing temperatures or frost. Provide protective insulating materials as necessary.

H. Provide erosion-control measures to prevent erosion or displacement of soils and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways.

I. Establish the gravel Construction Entrance.

J. Sampling and Preliminary Testing:

1. Prior to beginning any grading operations, the Contractor shall submit to the Architect/Engineer a proposed sequence of excavation operations.
2. Based upon the sequence of excavations, samples of the anticipated fill materials will be obtained as excavations proceed and tested for grain size, permeability, and moisture-density relationships using the Standard Proctor Method (ASTM D698, Method A).
3. Allow sufficient time for completion of laboratory tests of the soils being tested before beginning any fill operations with the soil in question.

3.3 DEWATERING

A. Prevent surface water and subsurface or groundwater from entering excavations, from ponding on prepared subgrades, and from flooding Project site and surrounding area.

B. Protect subgrades from softening, undermining, washout, and damage by rain or water accumulation.

1. Reroute surface water runoff away from excavated areas. Do not allow water to accumulate in excavations. Do not use excavated trenches as temporary drainage ditches.
2. Install a dewatering system to keep subgrades dry and convey ground water away from excavations. Maintain until dewatering is no longer required.

3.4 EXPLOSIVES

A. Explosives: Do not use explosives.

3.5 GENERAL EXCAVATION

A. Excavation is unclassified and includes excavation to subgrade elevations indicated, regardless of character of materials and obstructions encountered.

B. Suitable excavation material shall be transported to and placed in fill areas within the limits of the Work.

C. Unsuitable materials encountered under the building pad must be excavated to the extent as directed by the Architect/Engineer and replaced with suitable materials from on-site or off-site borrow excavations.

D. Unsuitable materials encountered in areas to be paved shall be excavated to a minimum of 2-feet below finish grade and replaced with suitable materials from on-site or off-site borrow excavations.

E. Unsuitable and surplus excavation materials, not required for subsequent fill or backfill, shall be disposed of off-site.

3.6 STABILITY OF EXCAVATIONS

A. General: Comply with all local codes, ordinances, and requirements of agencies having jurisdiction.

B. Slope side of excavations to comply with local codes, ordinances, and requirements of agencies having jurisdiction. Shore and brace where sloping is not possible because of space restrictions or stability of materials excavated. Maintain sides and slopes of excavations in safe condition until completion of backfill.

C. Shoring and Bracing: Provide materials for shoring and bracing, such as sheet piling, uprights, stringers, and cross bracing, in good serviceable condition. Maintain shoring and bracing in excavations during the entire time period excavations will be open. Extend shoring and bracing as excavation progresses.

3.7 TOPSOIL EXCAVATION

A. Excavate topsoil from areas to be further excavated, re-landscaped, or re-graded, without mixing with foreign materials and stockpile for latter use.

1. Strip topsoil to whatever depths encountered in a manner to prevent intermingling with underlying subsoil or other objectionable materials.
2. Where existing trees are indicated to remain, leave existing topsoil in-place within the drip line to prevent damage to root systems.

B. Stockpile in areas designated on site.

C. Do not remove topsoil when wet.

D. Stockpile topsoil to height not to exceed 8-feet. Cover to protect from erosion.

E. Do not allow topsoil to be mixed with subsoils.

3.8 SOIL EXCAVATION (CUTS)

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

B. Excavate subsoil from areas to be further excavated, re-landscaped, or re-graded.

C. Do not remove wet subsoil, unless it is subsequently processed to obtain optimum moisture content.

D. When excavating through roots, perform work by hand and cut roots with a sharp axe.

E. Benching Slopes: Horizontally bench existing slopes greater than 4:1 (4-horizontal to 1-vertical) to key fill material to slope for firm bearing.

F. Stability: Replace damaged or displaced subsoil to same requirements as for specified fill.

G. Rock Excavation:

1. Notify the Architect/Engineer upon encountering rock or similar materials that cannot be removed or excavated by conventional earth moving or ripping equipment.
2. Do not use explosives on the Owner's Property without written permission from the Architect/Engineer.

3.9 STORAGE OF SOIL MATERIALS

A. Stockpile borrow materials and satisfactory excavated soil materials. Stockpile soil materials without intermixing. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.

1. Stockpile soil materials away from edge of excavations. Do not store within drip line of remaining trees.

B. Stockpile excavated materials acceptable for backfill and fill where directed.

C. Stockpile excavated topsoil to be reused on-site; remove remainder from site.

D. Stockpile excavated subsoil, not placed directly into fill areas and to be reused at a later time, on-site; remove remainder from site.

3.10 BACKFILL AND FILL

A. Use fills consisting of suitable materials placed in loose lifts of 8-inches or less and rolled and/or vibrated with suitable equipment until compacted.

B. Do not place materials containing rocks or clumps that will pass through a 6-inch diameter ring within the top 12-inches of the surface of the completed fill. Do not place materials containing rocks that will not pass through a 1-inch ring within the top 6-inches of the completed fill.

C. Fill materials containing broken concrete or broken asphaltic pavements will not be acceptable.

D. General: Place and compact soil material in layers to required subgrade elevations, for each area classification listed below, using materials specified in Part 2 of this Section.

1. Under grass and planted areas; use satisfactory excavated or borrow soil material.
2. Under walks and pavements; use satisfactory excavated or borrow soil material and appropriate subbase material.
3. Under steps and ramps; use satisfactory excavated or borrow soil material and appropriate subbase material.
4. Under building slabs; use satisfactory excavated or borrow soil material and appropriate granular drainage fill subbase material.
5. Under footings and foundations; use satisfactory excavated or borrow soil material.

3.11 PLACEMENT AND COMPACTION

A. Fill area to contours and elevations with unfrozen, dry materials.

B. Ground Surface Preparation: Remove vegetation, debris, unsatisfactory soil materials, obstructions, and deleterious materials from ground surface prior to placement of fills. Plow strip, or break up sloped surfaces steeper than 4-horizontal to 1-vertical (4:1) such that fill materials will bond with existing surface.

C. When existing ground surface has a density less than that specified under "Compaction" for a particular area classification, break up ground surface, pulverize, moisture-condition to within 2-percent of optimum moisture content, and compact to required depth and percentage of maximum density.

D. Place backfill and fill materials in layers not more than 8-inches loose depth for material to be compacted by heavy compaction equipment, and not more than 4-inches loose depth for material to be compacted with hand-operated tampers.

E. Before compaction, moisten or aerate each layer as necessary to within 2-percent of optimum moisture content. Compact each layer to required percentage of maximum dry density or relative dry density for each area classification. Do not place backfill or fill material on surfaces that are muddy, frozen, or contain frost or ice.

F. Place backfill and fill materials evenly adjacent to structures, piping, or conduit to required elevations. Prevent wedging action of backfill against structures or displacement of piping or conduit by carrying material uniformly around structure, piping, or conduit to approximately the same elevation in each lift.

G. Control soil and fill compaction, providing a minimum percentage of density specified for each area classification indicated below. Correct improperly compacted areas or lifts as directed by the Architect/Engineer if soil density tests indicate inadequate compaction.

H. Percentage of Maximum Density Requirements: Compact soils to not less than the following percentages of maximum density per Modified Proctor.

1. Under structures, building slabs, steps, and pavements; compact top 12-inches of existing subgrade and each subsequent layer of backfill or fill material to 98-percent maximum density.
2. Under walkways; compact top 6-inches of existing subgrade and each subsequent layer of backfill or fill material to 95-percent maximum density.
3. Under lawn or unpaved areas; compact top 6-inches of existing subgrade and each subsequent layer of backfill or fill material to 90-percent maximum density.
4. Under existing pavements to be removed and replaced for utility installation; compact top 24-inches of existing subgrade and each subsequent layer of backfill or fill material to 98-percent maximum density.

I. Moisture Control: Where subgrade or layer of soil material must be moisture conditioned before compaction, uniformly apply water to surface of subgrade or layer of soil material. Apply water in minimum quantities as necessary to prevent free water from appearing on surface during or subsequent to compaction operations.

1. Remove and replace, or scarify and air dry, soil materials that are wet to permit compaction to specified density.
2. Stockpile or spread soil materials that have been removed because it is too wet to permit compaction. Assist drying by discing, harrowing, or pulverizing until moisture content is reduced to a satisfactory level.

J. Slope grades away from buildings a minimum of 3-inches in 10-feet, unless noted otherwise.

K. Make grade changes gradual. Blend slopes into level areas.

3.12 GRADING

A. General: Uniformly grade areas to a smooth surface, free from irregular surface changes. Comply with compaction requirements and grade to cross sections, lines, and elevations indicated.

B. Remove debris, roots, branches, and stones in excess of 1/2-inch in size. Remove soil contaminated with petroleum products.

C. Site Grading Outside Building Lines: Slope grades to direct water away from buildings and to prevent ponding. Finish subgrades to required elevations within the following tolerances:

1. Lawn or Unpaved Areas: Shape surfaces to receive topsoil to within not more than 0.1-foot.
2. Walks: Shape surface of areas under walks to line, grade, and cross-section to within not more than 0.1-foot.
3. Pavements: Shape surface of areas under pavements to line, grade, and cross-section to within not more than 1/2-inch.

D. Grading Inside Building Lines: Finish subgrade to a tolerance of 1/2 inch when tested with a 10-foot straightedge.

E. Compaction: After grading, compact subgrade surfaces to depth and indicated percentage per "Placement and Compaction."

F. Surface Roughening:

1. Where topsoil is to be placed, scarify surface to depth of 3-inches.
2. In areas where vehicles or equipment have compacted soils, scarify surface to a depth of 3-inches.
3. Cuts, Fills, and Graded Areas that will be Mowed:

   a. Make slopes to be mowed no steeper that 3-horizontal to 1-vertical (3:1).
   b. Roughen these areas with shallow grooves by normal tilling, disking, harrowing, or use of cultipacker-seeder. Make the final pass of any such tillage implement on the contour.
   c. Make grooves formed by such implements close together (less than 10-inches) and not less than 1-inch deep.
   d. Excessive roughness is undesirable for areas to be mowed.

4. Roughening with Tracked Machinery:

   a. Limit roughening with tracked machinery to sandy soils to avoid undue compaction of the soil surface. Tracking is generally not as effective as the other roughening methods described.
   b. Operate tracked machinery up and down the slope to leave horizontal depressions in the soil. Do not back-blade during final grading operations.

3.13 FINISH GRADING

A. General: Finish grading consists of preparation of all disturbed areas outside of structures, paving and other surfaces for the establishment of lawn areas.

B. Before Finish Grading:

1. Verify building and trench backfilling has been inspected.
2. Verify subgrade has been contoured and compacted.

C. Degree of finish shall be that ordinarily obtainable from a blade-grader, supplemented with hand raking and finishing.

D. Loosen subgrade of lawn areas to minimum depth of 4-inches. Remove stones measuring over 1-1/2 inches in any dimension. Remove sticks, roots, rubbish, and other extraneous matter. Limit preparation to areas that will be planted promptly after preparation.

E. Spread topsoil to minimum depth required to meet lines, grades, and elevations shown, after light rolling and natural settlement.

F. Place topsoil in areas where seeding, sodding, planting, and other landscaped areas are indicated.

G. Place topsoil to the following compacted thickness:

1. Areas to be Seeded with Grass: 6-inches.
2. Areas to be Sodded with Grass: 4-inches.

H. Place topsoil during dry weather.

I. Remove roots, weeds, rocks, and other foreign material while spreading.

J. Near existing plants, buildings and other features spread topsoil manually to prevent damage.

K. Fine grade topsoil to eliminate uneven areas and low spots. Maintain profiles and contours of subgrade.

3.14 TOLERANCES

A. Top Surface of Subgrade: Plus or minus 0.1-foot from required elevation.

B. Top Surface of Finish Grade: Plus or minus 1/2-inch from required elevation.

3.15 SUBBASE AND BASE COURSES

A. General: Subbase courses consist of placing subbase material, in layers of specified thicknesses, over subgrade surfaces to support a pavement base course.

1. Base courses, subbase courses, and drainage base courses are specified in Section 02721 - Aggregate Base Courses.

B. Excavation for Pavements: Cut surface under pavement to comply with cross-section, elevations, and grades as indicated.

C. Grade Control: During construction, maintain lines and grades including crown and cross-slope of subbase course.

D. Pavement Shoulders: Place shoulders along edges of subbase and base course to prevent lateral movement. Construct shoulders, at least 12-inches wide, of satisfactory soil materials and compact simultaneously with each subbase and base layer.

3.16 FIELD QUALITY CONTROL

A. Testing Agency: The Owner will engage a qualified independent geotechnical engineering testing agency to perform field quality control testing.

B. Allow Testing Agency to inspect and test subgrades and each fill or backfill layer. Proceed with subsequent earthwork only after test results for previously completed work comply with requirements.

C. Testing Agency will test compaction of soils in place according to ASTM D1556, ASTM D2167, ASTM D2922, and ASTM D2937, as applicable. Tests will be performed at the following locations and frequencies:

1. Paved and Building Slab Areas: At subgrade and at each compacted fill and backfill layer, at least one (1) test for every 2,000 sq. ft. or less of paved area or building slab, but in no case fewer than three (3) tests.

D. When Testing Agency reports that subgrades, fills, or backfills have not achieved degree of compaction specified, scarify and moisten or aerate, or remove and replace soil to depth required; recompact and retest until specified compaction is obtained.

E. Proofrolling: The Contractor shall proofroll subgrade areas that will receive paving, structures on fill or impervious lining material.

1. Make at least three (3) passes with a 25 to 50-ton rubber tired vehicle over the entire area.
2. Unstable, soft or otherwise unsuitable materials revealed by the proofrolling shall be removed and replaced with satisfactory materials and compacted as specified.

3.17 PROTECTION

A. Protecting Graded Areas: Protect newly graded areas from traffic, freezing, and erosion. Keep free of trash and debris.

B. Repair and reestablish grades to specified tolerances where completed or partially completed surfaces become eroded, rutted, settled, or where they lose compaction due to subsequent construction operations or weather conditions.

1. Scarify or remove and replace soil material to depth as directed by the Architect/Engineer; reshape and recompact.

C. Where settling occurs before Project correction period elapses, remove finished surfacing, backfill with additional soil material, compact, and reconstruct surfacing.

1. Restore appearance, quality, and condition of finished surfacing to match adjacent work, and eliminate evidence of restoration to the greatest extent possible.

3.18 DISPOSAL OF SURPLUS AND WASTE MATERIALS

A. Disposal: Remove surplus satisfactory soil and waste material, including unsatisfactory soil, trash, and debris, and legally dispose of it off Owner's property.

END OF SECTION 31 20 00

SECTION 31 23 19 - DEWATERING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes construction dewatering.

1.3 PERFORMANCE REQUIREMENTS

A. Dewatering Performance: Design, furnish, install, test, operate, monitor, and maintain dewatering system of sufficient scope, size, and capacity to control hydrostatic pressures and to lower, control, remove, and dispose of ground water and permit excavation and construction to proceed on dry, stable subgrades.

1. Delegated Design: Design dewatering system, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.
2. Continuously monitor and maintain dewatering operations to ensure erosion control, stability of excavations and constructed slopes, that excavation does not flood, and that damage to subgrades and permanent structures is prevented.
3. Prevent surface water from entering excavations by grading, dikes, or other means.
4. Accomplish dewatering without damaging existing buildings, structures, and site improvements adjacent to excavation.
5. Remove dewatering system when no longer required for construction.

1.4 SUBMITTALS

A. Shop Drawings: For dewatering system. Show arrangement, locations, and details of wells and well points; locations of risers, headers, filters, pumps, power units, and discharge lines; and means of discharge, control of sediment, and disposal of water.

1. Include layouts of piezometers and flow-measuring devices for monitoring performance of dewatering system.
2. Include a written plan for dewatering operations including control procedures to be adopted if dewatering problems arise.

B. Delegated-Design Submittal: For dewatering system indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

C. Qualification Data: For qualified Installer and professional engineer.

D. Field quality-control reports.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer that has specialized in design of dewatering systems anddewatering work.

B. Regulatory Requirements: Comply with governing EPA notification regulations before beginning dewatering. Comply with hauling and disposal regulations of authorities having jurisdiction.

C. Preinstallation Conference: Conduct conference at Project site.

1. Review methods and procedures related to dewatering including, but not limited to, the following:

a. Inspection and discussion of condition of site to be dewatered including coordination with temporary erosion control measures and temporary controls and protections.
b. Geotechnical report.
c. Proposed site clearing and excavations.
d. Existing utilities and subsurface conditions.
e. Coordination for interruption, shutoff, capping, and continuation of utility services.
f. Construction schedule. Verify availability of Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
g. Testing and monitoring of dewatering system.

1.6 PROJECT CONDITIONS

A. Interruption of Existing Utilities: Do not interrupt any utility serving facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary utility according to requirements indicated:

1. Notify Construction Manager no fewer than three days in advance of proposed interruption of utility.
2. Do not proceed with interruption of utility without Construction Manager's written permission.

B. Project-Site Information: A geotechnical report has been prepared for this Project and is in the specification manual. The opinions expressed in this report are those of geotechnical engineer and represent interpretations of subsoil conditions, tests, and results of analyses conducted by geotechnical engineer. Owner will not be responsible for interpretations or conclusions drawn from this data.

1. Make additional test borings and conduct other exploratory operations necessary for dewatering.
2. The geotechnical report is included elsewhere in the Project Manual.

C. Survey Work: Engage a qualified land surveyor or professional engineer to survey adjacent existing buildings, structures, and site improvements, establishing exact elevations at fixed points to act as benchmarks. Clearly identify benchmarks and record existing elevations.

1. During dewatering, regularly resurvey benchmarks, maintaining an accurate log of surveyed elevations for comparison with original elevations. Promptly notify Architect if changes in elevations occur or if cracks, sags, or other damage is evident in adjacent construction.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 PREPARATION

A. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by dewatering operations.

1. Prevent surface water and subsurface or ground water from entering excavations, from ponding on prepared subgrades, and from flooding site and surrounding area.
2. Protect subgrades and foundation soils from softening and damage by rain or water accumulation.

B. Install dewatering system to ensure minimum interference with roads, streets, walks, and other adjacent occupied and used facilities.

1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction. Provide alternate routes around closed or obstructed traffic ways if required by authorities having jurisdiction.

C. Provide temporary grading to facilitate dewatering and control of surface water.

D. Monitor dewatering systems continuously.

E. Promptly repair damages to adjacent facilities caused by dewatering.

F. Protect and maintain temporary erosion and sedimentation controls, which are specified in Division 31 Section "Site Clearing" during dewatering operations.

3.2 INSTALLATION

A. Install dewatering system utilizing wells, well points, or similar methods complete with pump equipment, standby power and pumps, filter material gradation, valves, appurtenances, water disposal, and surface-water controls.

1. Space well points or wells at intervals required to provide sufficient dewatering.
2. Use filters or other means to prevent pumping of fine sands or silts from the subsurface.

B. Before excavating below ground-water level, place system into operation to lower water to specified levels. Operate system continuously until drains, sewers, and structures have been constructed and fill materials have been placed or until dewatering is no longer required.

C. Provide an adequate system to lower and control ground water to permit excavation, construction of structures, and placement of fill materials on dry subgrades. Install sufficient dewatering equipment to drain water-bearing strata above and below bottom of foundations, drains, sewers, and other excavations.

1. Do not permit open-sump pumping that leads to loss of fines, soil piping, subgrade softening, and slope instability.

D. Reduce hydrostatic head in water-bearing strata below subgrade elevations of foundations, drains, sewers, and other excavations.

1. Maintain piezometric water level a minimum of 24 inches (600 mm) below surface of excavation.

E. Dispose of water removed by dewatering in a manner that avoids endangering public health, property, and portions of work under construction or completed. Dispose of water and sediment in a manner that avoids inconvenience to others. Provide sumps, sedimentation tanks, and other flow-control devices as required by authorities having jurisdiction.

F. Provide standby equipment on site, installed and available for immediate operation, to maintain dewatering on continuous basis if any part of system becomes inadequate or fails. If dewatering requirements are not satisfied due to inadequacy or failure of dewatering system, restore damaged structures and foundation soils at no additional expense to Owner.

1. Remove dewatering system from Project site on completion of dewatering. Plug or fill well holes with sand or cut off and cap wells a minimum of 36 inches (900 mm) below overlying construction.

G. Damages: Promptly repair damages to adjacent facilities caused by dewatering operations.

3.3 FIELD QUALITY CONTROL

A. Observation Wells: Provide, take measurements, and maintain at least the minimum number of observation wells or piezometers indicated; additional observation wells may be required by authorities having jurisdiction.

1. Observe and record daily elevation of ground water and piezometric water levels in observation wells.
2. Repair or replace, within 24 hours, observation wells that become inactive, damaged, or destroyed. In areas where observation wells are not functioning properly, suspend construction activities until reliable observations can be made. Add or remove water from observation-well risers to demonstrate that observation wells are functioning properly.
3. Fill observation wells, remove piezometers, and fill holes when dewatering is completed.

B. Provide continual observation to ensure that subsurface soils are not being removed by the dewatering operation.

END OF SECTION 31 23 19

SECTION 31 31 16 – TERMITE CONTROL

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SECTION INCLUDES

A. Chemical Soil Treatment for Subterranean Termite Control.

1. Below slabs-on-grade.
2. Under, and at the perimeter of, interior and exterior foundations.

1.3 REFERENCES

A. Title 7, United States Code, 136 through 136y – Federal Insecticide, Fungicide and Rodenticide Act; United States Code; 1947 (Revised 1988).

1.4 DEFINITIONS

A. EPA: Environmental Protection Agency.

B. PCO: Pest control operator.

1.5 SUBMITTALS

A. See Division 1 Specification Sections for submittal procedures.

B. Product Data: Treatments and application instructions, including EPA-Registered Label.

1. Indicate toxicants to be used, composition by percentages, dilution schedule, and intended application rates.
2. Indicate caution requirements and include Manufacturer's labels and seals identifying contents.

C. Product Certificates: Signed by manufacturers of termite control products certifying that treatments furnished comply with requirements.

1. Indicate regulatory agency approval reports when required.
2. Certify that toxicants meet or exceed specified required and all requirements of authorities having jurisdiction.

D. Qualification Data: For firms and persons specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.

E. Soil Treatment Application Report: After application of termiticide is completed, submit report for Owner's record information, including the following as applicable:

1. Date and time of application.
2. Moisture content of soil before application.
3. Brand name and manufacturer of termiticide.
4. Quantity of undiluted termiticide used.
5. Dilutions, methods, volumes, and rates of application used.
6. Areas of application.
7. Water source for application.

F. Maintenance Data: Indicate re-treatment schedule and warranty period.

G. Warranties: Submit manufacturer's warranty and ensure that forms have been completed in the Owner's name and registered with the manufacturer.

1.6 QUALITY ASSURANCE

A. Applicator Qualifications: A PCO who is licensed according to regulations of authorities having jurisdiction to apply termite control treatment in jurisdiction where Project is located and who is experienced and has completed termite control treatment similar to that indicated for this Project and whose work has a record of successful in-service performance.

1. Company specializing in performing the Work of this Section with minimum 3-years documented experienced, approved by manufacturer, and licensed in the State of South Carolina.

2. All termite pesticides shall be provided in strict accordance to South Carolina Pesticide Control Act (SC Law 46-13 and Amendments) and Federal Regulations.

1.7 REGULATORY REQUIREMENTS

A. Formulate and apply termiticides, and label with a Federal registration number, to comply with EPA regulations and authorities having jurisdiction.

B. Conform to applicable State of South Carolina codes for requirements for application, application licensing, and authority to use toxicant chemicals in accordance with EPA regulations.

C. Provide certificate of compliance from authority having jurisdiction indicating approval of toxicants.

D. The contractor shall notify Clemson University Pesticide and Controls Program (DPR) prior to beginning of treatment and application (864.646.2121).

1.8 PROJECT CONDITIONS

A. Environmental Limitations: To ensure penetration, do not treat soil that is water saturated or frozen. Do not treat soil while precipitation is occurring. Comply with EPA-Registered Label requirements and requirements of authorities having jurisdiction.

1.9 COORDINATION

A. Coordinate soil treatment application with excavating, filling, and grading and concreting operations. Treat soil under footings, grade beams, and ground-supported slabs, before construction.

1. Apply toxicant a minimum of 12-hours prior to installation of vapor barrier under slabs-on-grade or finish grading work outside foundation walls.

1.10 WARRANTY

A. See Division 1 Specification Sections for additional warranty requirements.

B. General Warranty: Special warranty specified in this Article shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.

C. Special Warranty: Written warranty, signed by applicator and Contractor certifying that termite control work, consisting of applied soil termiticide treatment, will prevent infestation of subterranean termites. If subterranean termite activity or damage is discovered during warranty period, re-treat soil and repair or replace damage caused by termite infestation.

D. Warranty Period: Five years from date of Substantial Completion.

E. Inspect and report annually to the Owner in writing. Provide inspection services for the entire Warranty Period stipulated from the Date of Substantial Completion.

1.11 MAINTENANCE SERVICE

A. Continuing Service: Provide a proposal for continuing service, including monitoring, inspection, and re-treatment for occurrences of termite activity, from applicator to Owner, in the form of a standard yearly (or other period) continuing service agreement, starting on the date of the end of the Warranty Period. State services, obligations, conditions, and terms for agreement period and for future renewal options.

PART 2 - PRODUCTS

2.1 TOXICANTS

A. Termiticide: Provide an EPA-registered termiticide complying with requirements of authorities having jurisdiction, in a soluble or emulsible, concentrated formulation that dilutes with water or foaming agent, and formulated to prevent termite infestation. Use only soil treatment solutions that are not harmful to plants. Provide quantity required for application at the label volume and

rate for the maximum termiticide concentration allowed for each specific use, according to the product's EPA-Registered Label.

B. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:

1. Chloropyrifos:

   a. Dursban TC, DowElanco.
   b. Cheminova.
   c. Garda.
   d. Or equal.

2. Permathrin:

   a. Dragnet FT, FMC Corp.; Pest Control Specialties.
   b. Torpedo, ICI Americas, Inc.
   c. Surrender.
   d. Or equal.

3. Cypermethrine:

   a. Prevail FT, FMC Corp.; Pest Control Specialties.
   b. Demom, ICI Americas, Inc.
   c. Cynoff.
   d. Or equal.

4. Fenvalerate:

   a. Gold Coast Tribute, DuPont.
   b. AgroEvo.
   c. Tribute.
   d. Or equal.

5. Isofenphose:

   a. Pryfon, Mobay Corp.
   b. Prelude.
   c. Prevail.
   d. Or equal.

C. Dilutant: As recommended by toxicant manufacturer.

2.2 MIXES

A. Mix toxicant chemical with dilutant in ratios as specified in manufacturer's written instructions for each type of application and as required by governing authorities.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Applicator present, for compliance with requirements for moisture content of the soil, interfaces with earthwork, slab and foundation work, landscaping, and other conditions affecting performance of termite control. Proceed with application only after unsatisfactory conditions have been corrected.

B. Verify that soil surfaces are unfrozen, sufficiently dry to absorb toxicant, and ready to receive treatment.

C. Verify that final grading is complete.

3.2 PREPARATION

A. General: Comply with the most stringent requirements of authorities having jurisdiction and with manufacturer's written instructions for preparing substrate. Remove all extraneous sources of wood cellulose and other edible materials such as wood debris, tree stumps and roots, stakes, formwork, and construction waste wood from soil and around foundations.

B. Soil Treatment Preparation: Remove foreign matter and impermeable soil materials that could decrease treatment effectiveness on areas to be treated. Loosen, rake, and level soil to be treated, except previously compacted areas under slabs and footings. Termiticides may be applied before placing compacted fill under slabs if recommended by termiticide manufacturer.

C. Fit filling hose connected to water source at the site with a backflow preventer, complying with requirements of authorities having jurisdiction.

3.3 APPLICATION

A. General: Comply with the most stringent requirements of authorities having jurisdiction and with manufacturer's EPA-Registered Label for products.

B. Application: Mix soil treatment termiticide solution to a uniform consistency. Provide quantity required for application at the label volume and rate for the maximum specified concentration of termiticide, according to manufacturer's EPA-Registered Label, to the following so that a continuous horizontal and vertical termiticidal barrier or treated zone is established around and under building construction. Distribute the treatment evenly.

1. Slabs-on-Grade: Treat under ground-supported slab construction, including footings, building slabs, and attached slabs as an overall treatment. Treat soil materials before concrete footings and slabs are placed.
2. Foundations: Treat adjacent soils including soil along entire inside perimeter of foundation walls, along both sides of interior partition walls, around plumbing pipes and electrical conduit penetrating slab, and around interior column footings, piers, and chimney bases; and along entire outside perimeter, from grade to bottom of footing. Avoid soil washout around footings.
3. Masonry: Treat voids in masonry foundation walls.
4. Penetrations: Treat at expansion joints, control joints, and areas where slabs will be penetrated.

C. Avoid disturbance of treated soil after application. Keep off treated areas until completely dry.

D. Protect termiticide solution, dispersed in treated soils and fills, from being diluted until ground-supported slabs are installed. Use waterproof barrier according to EPA-Registered Label instructions.

E. Post warning signs in areas of application.

F. Reapply soil treatment solution to areas disturbed by subsequent excavation, grading, landscaping, or other construction activities following application.

G. If inspection or testing identifies the presence of termites, re-treat soil and re-test.

3.4 PROTECTION OF FINISHED WORK

A. Do not permit soil grading over treated work.

END OF SECTION 31 31 16

SECTION 31 50 00 - EXCAVATION SUPPORT AND PROTECTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes temporary and permanent excavation support and protection systems.

B. Related Sections:

1. Section 015000 "Temporary Facilities and Controls" for temporary utilities and support facilities.
2. Section 312319 "Dewatering" for dewatering system for excavations.

1.3 PERFORMANCE REQUIREMENTS

A. Design, furnish, install, monitor, and maintain excavation support and protection system capable of supporting excavation sidewalls and of resisting soil and hydrostatic pressure and superimposed and construction loads.

1. Delegated Design: Design excavation support and protection system, including comprehensive engineering analysis by a qualified professional engineer licensed in South Carolina, using performance requirements and design criteria indicated.
2. Soil nails shall be the system used for the wall design. Soil nails along Assembly Street shall not exceed 35'-0" in length from the face of wall which will prevent the nails from encroaching into the Assembly Street right-of-way. Soil nails along Greene Street and Park Street shall not exceed 30'-0" in length from the face of wall.
3. Soil nail locations shall be coordinated with existing utilities.
4. Prevent surface water from entering excavations by grading, dikes, or other means.
5. Install excavation support and protection systems without damaging existing buildings, structures, and site improvements adjacent to excavation.
6. Monitor vibrations, settlements, and movements.
7. Deflections shall not impact adjacent roadways or utilities and shall not impact final architectural design based on short and long term deflections.
8. A permanent passive drainage system shall be designed and installed for the walls unless full hydrostatic pressure is considered in the wall design. Any water migration or associated soil staining may not be expressed on the visible face of the wall.
9. Long term stability and soundness shall be considered in the wall design. Final architectural facing shall not be considered for strength in the structural design as other than imposed load.
10. Design shall consider 150 psf supplemental dead load per square foot of wall surface for horizontal seismic loading due to the architectural facings and wall cap assuming a future 4 foot attachment pattern of the facing wall each way.

11. Walls shall be designed and installed such that existing site walls to remain are not undermined or compromised. Drawings of the existing walls are available from the Owner.
12. New excavations and installations may not negatively impact performance of existing walls and waterproofing.
13. Permanent wall design shall allow for 5 foot minimum of adjacent excavation to allow for building footing installation.
14. Street traffic surcharge per AASHTO shall be considered where in the influence of the wall pressures.
15. Both local and global stability shall be considered in the design.

1.4 ACTION SUBMITTALS

A. Shop Drawings: For excavation support and protection system.

B. Delegated-Design Submittal: For the excavation support and protection system indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified professional engineer.

B. Other Informational Submittals:

1. Photographs or Videotape: Show existing conditions of adjacent construction and site improvements that might be misconstrued as damage caused by the absence of, the installation of, or the performance of excavation support and protection systems. Submit before Work begins.
2. Record Drawings: Identifying and locating capped utilities and other subsurface structural, electrical, or mechanical conditions.

    a. Note locations and capping depth of wells and well points.

1.6 QUALITY ASSURANCE

A. Preinstallation Conference: Conduct conference at Project site.

1. Review methods and procedures related to excavation support and protection system including, but not limited to, the following:

    a. Geotechnical report.
    b. Existing utilities and subsurface conditions.
    c. Proposed excavations.
    d. Proposed equipment.
    e. Monitoring of excavation support and protection system.
    f. Working area location and stability.
    g. Coordination with waterproofing.
    h. Abandonment or removal of excavation support and protection system.
    i. Permanent architectural facing of supports to remain in place.

1.7 PROJECT CONDITIONS

A. Interruption of Existing Utilities: Do not interrupt any utility serving facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary utility according to requirements indicated:

1. Notify Construction Manager and Owner no fewer than three weeks in advance of proposed interruption of utility.
2. Do not proceed with interruption of utility without Construction Manager's and Owner's written permission.

B. Project-Site Information: A geotechnical report has been prepared for this Project and is available for information only. The opinions expressed in this report are those of geotechnical engineer and represent interpretations of subsoil conditions, tests, and results of analyses conducted by geotechnical engineer. Owner will not be responsible for interpretations or conclusions drawn from the data.

1. Make additional test borings and conduct other exploratory operations necessary for excavation support and protection.
2. The geotechnical report is included elsewhere in the Project Manual.

C. Survey Work: Engage a qualified land surveyor or professional engineer to survey adjacent existing buildings, structures, and site improvements; establish exact elevations at fixed points to act as benchmarks. Clearly identify benchmarks and record existing elevations.

1. During installation of excavation support and protection systems, regularly resurvey benchmarks, maintaining an accurate log of surveyed elevations and positions for comparison with original elevations and positions. Promptly notify Architect if changes in elevations or positions occur or if cracks, sags, or other damage is evident in adjacent construction.

PART 2 - PRODUCTS

2.1 MATERIALS

A. General: Provide materials that are either new or in serviceable condition.

B. Structural Steel: ASTM A 36/A 36M, ASTM A 690/A 690M, or ASTM A 992/A 992M.

C. Concrete or Steel: As required for the strength and size needed for the application.

D. Cast-in-Place Concrete: ACI 301, of compressive strength required for application.

E. Reinforcing Bars: ASTM A 615/A 615M, Grade 60 (Grade 420), deformed.

F. Soil Nails: As required for the strength and size needed for the application.

G. Shotcrete: Comply with Section 03 37 13 "Shotcrete" for shotcrete materials and mixes, reinforcement, and shotcrete application.

PART 3 - EXECUTION

3.1 PREPARATION

A. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards that could develop during excavation support and protection system operations.

1. Shore, support, and protect utilities encountered.

B. Install excavation support and protection systems to ensure minimum interference with roads, streets, walks, and other adjacent occupied and used facilities.

1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction. Provide alternate routes around closed or obstructed traffic ways if required by authorities having jurisdiction.

C. Locate excavation support and protection systems clear of permanent construction so that forming and finishing of concrete surfaces are not impeded.

D. Monitor excavation support and protection systems daily during excavation progress and for as long as excavation remains open. Promptly correct bulges, breakage, or other evidence of movement to ensure that excavation support and protection systems remain stable.

E. Promptly repair damages to adjacent facilities caused by installing excavation support and protection systems.

3.2 SOIL NAILS AND SHOTCRETE

A. Install soil nails in excavation depths not exceeding the local stability of the slope. Shotcrete wall face before repeating the soil nail installation. Accurately align exposed faces of flanges to vary not more than 2 inches (50 mm) from a horizontal line and not more than 1:360 out of vertical alignment.

B. Wall shall be installed with a vertical exposed face.

C. Install geotextile and drainage mat behind the wall ("Mira Drain" or approved equivalent) and seal joints.

3.3 SOIL NAILS

A. Soil Nails: Drill, install, grout, and tension soil nails. Test load-carrying capacity of each soil nail and replace and test deficient soil nails.

1. Test loading shall be observed by a qualified professional engineer responsible for design of excavation support and protection system.

3.4 REMOVAL AND REPAIRS

A. Leave excavation support and protection systems permanently in place unless specifically indicated to be removed.

1. Repair or replace, as approved by Architect, adjacent work damaged or displaced by installing the excavation support and protection systems.

END OF SECTION 31 50 00

DIVISION 32 – EXTERIOR IMPROVEMENTS

SECTION 32 13 13 –CONCRETE PAVING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes exterior Portland Cement Concrete Pavement for the following:

1. Driveways.
2. Curbs and Gutters.
3. Sidewalks and Outside Pads with integral turndowns.
4. Miscellaneous Concrete.

1.3 LEED BUILDING GENERAL REQUIREMENTS

A. The University of South Carolina requires the Contractor to implement practices and procedures to meet the project's environmental performances goals, which include achieving LEED Certification. Specific project goals that may impact this area of work include: use of recycled-content materials; use of locally-manufactured materials; use of low-emitting materials; construction waste recycling; and the implementation of a construction indoor air quality management plan. The Contractor shall ensure that the requirements related to these goals, as defined in the sections below, are implemented to the fullest extent. Substitutions shall not be allowed if such changes comprise the stated LEED BUILDING Performance Criteria.

1.4 REFERENCES

A. See Division 3 Specification Sections for applicable references.

B. ACI 211.1 – Standard Practice for Selecting Proportions for Normal, Heavyweight, and Mass Concrete; American Concrete Institute International; 1991.

C. ACI 301 – Specifications for Structural Concrete for Buildings; American Concrete Institute International; 1996.

D. ACI 304R – Guide for Measuring, Mixing, Transporting, and Placing Concrete; American Concrete Institute International; 1989.

E. ACI 305R – Hot Weather Concreting; American Concrete Institute International; 1991.

F. ACI 306R – Cold Weather Concreting; American Concrete Institute International; 1988.

G. ASTM A185 – Standard Specification for Welded Steel Wire Fabric, Plain, for Concrete Reinforcement; 1994.

H. ASTM A497 – Standard Specification for Steel Welded Wire Fabric, Deformed, for Concrete Reinforcement; 1995.

I. ASTM A615/A615M – Standard Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement; 1996a.

J. ASTM C33 – Standard Specification for Concrete Aggregates; 1993.

K. ASTM C39 – Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens; 1996.

L. ASTM C94 – Standard Specification for Ready-Mixed Concrete; 1996.

M. ASTM C150 – Standard Specification for Portland Cement; 1996.

N. ASTM C173 – Standard Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method; 1994a.

O. ASTM C260 – Standard Specification for Air-Entraining Admixtures for Concrete; 1995.

P. ASTM C309 – Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete; 1997.

Q. ASTM C494 - Standard Specification for Chemical Admixtures for Concrete; 1992.

R. ASTM C618 - Standard Specification for Coal Fly Ash and Raw or Calcinated Natural Pozzolan for Use as a Mineral Admixture in Portland Cement Concrete; 1996a.

S. ASTM C685 - Standard Specification for Concrete Made by Volumetric Batching and Continuous Mixing; 1995a.

T. ASTM C1116 - Standard Specification for Fiber-Reinforced Concrete and Shotcrete; 1995.

U. ASTM D1752 - Standard Specification for Preformed Sponge Rubber and Cork Expansion Joint Fillers for Concrete Paving and Structural Construction; 1984 (Re-Approved 1996).

1.5 DEFINITIONS

A. Cementitious Materials: Portland cement alone or in combination with one or more of blended hydraulic cement, expansive hydraulic cement, fly ash and other pozzolans, ground granulated blast-furnace slag, and silica fume.

1.6 SUBMITTALS

A. See Division 1 Specification Sections for submittal procedures.

B. Quality Control Submittals: Submit the following information related to quality assurance requirements.

1. Design Date: Submit proposed mix designs and test data before concrete operations begin. Identify for each mix submitted, the method by which proportions have been selected.

a. For mix designs based on field experience, include individual strength test results no older than six (6) months from time of submission, standard deviations, and required average compressive strength calculations.
b. Indicate quantities of each ingredient per cubic yard of concrete.
c. Indicate type and quantity of admixtures proposed to be required.

2. Test Reports: Submit laboratory test reports for all testing specified.
3. Certifications: Submit affidavits from an independent test agency certifying that all materials furnished under this section conform to these specifications.
4. Certifications: Provide certification from manufacturers of concrete admixtures that chloride content complies with specified requirements.
5. Certifications: Submit mill test certificates for all reinforcing steel furnished under this section, showing physical and chemical analysis.
6. Placement Schedule: Submit concrete placement schedule prior to start of any concrete placement operations. Include locations of all joints indicated on the Drawings, plus anticipated construction joints.
7. Submit batch tickets complying with ASTM C685 or delivery tickets complying with ASTM C94, as applicable, for each concrete batch used in the Work.

   a. Include on ticket the additional information specified in the ASTM document.

8. Hot Weather Concrete Placement: Submit description of planned protective measures.

C. Product Data: For each type of manufactured material and product indicated.

D. Design Mixes: For each concrete pavement mix. Include alternate mix designs when characteristics of materials, project conditions, weather, test results, or other circumstances warrant adjustments.

E. Material Test Reports: From a qualified testing agency indicating and interpreting test results for compliance of the following with requirements indicated, based on comprehensive testing of current materials:

F. Material Certificates: Signed by manufacturers certifying that each of the following materials complies with requirements:

1. Cementitious materials and aggregates.
2. Steel reinforcement and reinforcement accessories.
3. Fiber reinforcement.
4. Admixtures.
5. Curing compounds.
6. Applied finish materials.
7. Bonding agent or adhesive.
8. Joint fillers.

G. Design Data: Indicate pavement thickness, designed concrete strength, reinforcement, and typical details.

H. Minutes of preinstallation conference.

1.7 QUALITY ASSURANCE

A. Perform Work in accordance with ACI 301, SCDOT Standard Specifications, and local governing authority standards.

B. Installer Qualifications: An experienced installer who has completed concrete pavement work similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.

C. Manufacturer Qualifications: Manufacturer of ready-mixed concrete products complying with ASTM C94 requirements for production facilities and equipment.

1. Manufacturer must be certified according to the National Ready Mix Concrete Association's Plant Certification Program.

D. Source Limitations: Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant and each aggregate from one source.

E. ACI Publications: Comply with ACI 301, "Specification for Structural Concrete," unless modified by the requirements of the Contract Documents.

F. Concrete Testing Service: Engage a qualified independent testing agency to perform material evaluation tests and to design concrete mixes.

G. Pre-Installation Conference: Conduct conference at Project site to comply with requirements in Division 1 Specification Sections.

1. Before submitting design mixes, review concrete pavement mix design and examine procedures for ensuring quality of concrete materials. Require representatives of each entity directly concerned with concrete pavement to attend, including the following:

a. Contractor's superintendent.
b. Independent testing agency responsible for concrete design mixes.
c. Ready-mix concrete producer.
d. Concrete subcontractor.

1.8 ENVIRONMENTAL REQUIREMENTS

A. Follow recommendations of ACI 305R when placing concrete during hot weather.

B. Follow recommendations of ACI 306R when placing concrete during cold weather.

C. Do not place concrete when base surface temperature is less than 40 deg F.

1.9 PROJECT CONDITIONS

A. Traffic Control: Maintain access for vehicular and pedestrian traffic as required for other construction activities.

PART 2 - PRODUCTS

2.1 FORM MATERIALS

A. Form Materials: Plywood, metal, metal-framed plywood, or other approved panel-type materials to provide full-depth, continuous, straight, smooth exposed surfaces complying with ACI 301. See Division 3 Specifications for additional information.

1. Use flexible or curved forms for curves of a radius 100-feet or less.

B. Form-Release Agent: Commercially formulated form-release agent with a maximum of 350-mg/l volatile organic compounds (VOCs) that will not bond with, stain, or adversely affect concrete surfaces and will not impair subsequent treatments of concrete surfaces.

2.2 STEEL REINFORCEMENT

A. Reinforcing Steel and Wire Fabric: See Division 3 Specification Sections for additional information.

B. Plain-Steel Welded Wire Fabric: ASTM A185, fabricated from as-drawn steel wire into flat sheets.

C. Deformed-Steel Welded Wire Fabric: ASTM A497, flat sheet.

D. Epoxy-Coated Welded Wire Fabric: ASTM A884, Class A, plain steel.

E. Reinforcement Bars: ASTM A615, Grade 60, deformed.

F. Epoxy-Coated Reinforcement Bars: ASTM A775; with ASTM A615, Grade 60, deformed bars.

G. Steel Bar Mats: ASTM A184; with ASTM A615, Grade 60, deformed bars; assembled with clips.

H. Plain Steel Wire: ASTM A82, as drawn.

I. Epoxy-Coated Wire: ASTM A884, Class A coated, plain steel.

J. Joint Dowel Bars: Plain steel bars, ASTM A615, Grade 60. Cut bars true to length with ends square and free of burrs.

K. Epoxy-Coated Joint Dowel Bars: ASTM A775; with ASTM A615, Grade 60, plain steel bars.

L. Tie Bars: ASTM A615, Grade 60, deformed.

M. Hook Bolts: ASTM A307, Grade A, internally and externally threaded. Design hook-bolt joint assembly to hold coupling against pavement form and in position during concreting operations, and to permit removal without damage to concrete or hook bolt.

N. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcement bars, welded wire fabric, and dowels in place. Manufacture bar supports according to CRSI's "Manual of Standard Practice" from steel wire, plastic, or precast concrete or fiber-reinforced concrete of greater compressive strength than concrete, and as follows:

1. Equip wire bar supports with sand plates or horizontal runners where base material will not support chair legs.
2. For epoxy-coated reinforcement, use epoxy-coated or other dielectric-polymer coated wire bar supports.

O. Epoxy Repair Coating: Liquid two-part epoxy repair coating, compatible with epoxy coating on reinforcement.

2.3 CONCRETE MATERIALS

A. General: Use the same brand and type of cementitious material from the same manufacturer throughout the Project.

B. Concrete Materials: See Division 3 Specification Sections for additional information.

C. Portland Cement: ASTM C150, Type I or II.

1. Fly Ash: ASTM C618, Class F or C.
2. Ground Granulated Blast-Furnace Slag: ASTM C989, Grade 100 or 120.

D. Blended Hydraulic Cement: ASTM C595M, Type IS, portland blast-furnace slag cement.

E. Blended Hydraulic Cement: ASTM C595M, Type IP portland pozzolan cement.

F. Blended Hydraulic Cement: ASTM C595M, Type I (PM) pozzolan-modified portland cement.

G. Blended Hydraulic Cement: ASTM C595M, Type I (SM) slag-modified portland cement.

H. Aggregate: ASTM C33, uniformly graded, from a single source, with coarse aggregate as follows:

1. Class: 4M.*
2. Maximum Aggregate Size: 1-inch nominal.*
3. Do not use fine or coarse aggregates containing substances that cause spalling.

I. Water: ASTM C94.

2.4 ADMIXTURES

A. General: Admixtures certified by manufacturer to contain not more than 0.1-percent water-soluble chloride ions by mass of cement and to be compatible with other admixtures.

B. Air-Entraining Admixture: ASTM C260, certified by manufacturer to be compatible with other required admixtures.

C. Water-Reducing Admixture: ASTM C494, Type A.

D. High-Range, Water-Reducing Admixture: ASTM C494, Type F or Type G.

E. Water-Reducing and Accelerating Admixture: ASTM C494, Type E.

F. Water-Reducing and Retarding Admixture: ASTM C494, Type D.

2.5 CURING MATERIALS

A. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. dry.

B. Moisture-Retaining Cover: ASTM C171, polyethylene film or white burlap-polyethylene sheet.

C. Water: Potable.

D. Evaporation Retarder: Waterborne, monomolecular film forming, manufactured for application to fresh concrete.

E. Clear Solvent-Borne Liquid-Membrane-Forming Curing Compound: ASTM C309, Type 1, Class B.

1. Provide material that has a maximum volatile organic compound (VOCs) rating of 350-mg pr liter.

F. Clear Waterborne Membrane-Forming Curing Compound: ASTM C309, Type 1, Class B.

G. White Waterborne Membrane-Forming Curing Compound: ASTM C309, Type 2, Class B.

H. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:

1. Evaporation Retarder:

a. Cimfilm; Axim Concrete Technologies.
b. Finishing Aid Concentrate; Burke Group, LLC (The).
c. Spray-Film; ChemMasters.
d. Aquafilm; Conspec Marketing & Manufacturing Co., Inc.
e. Sure Film; Dayton Superior Corporation.
f. Eucobar; Euclid Chemical Co.
g. Vapor Aid; Kaufman Products, Inc.
h. Lambco Skin; Lambert Corporation.
i. E-Con; L&M Construction Chemicals, Inc.
j. Confilm; Master Builders, Inc.
k. Waterhold; Metalcrete Industries.
l. Rich Film; Richmond Screw Anchor Co.
m. SikaFilm; Sika Corporation.
n. Finishing Aid; Symons Corporation.
o. Certi-Vex EnvioAssist; Vexcon Chemicals, Inc.

2. Clear Solvent-Borne Liquid-Membrane-Forming Curing Compound:

a. AH Curing Compound #2 DR; Anti-Hydro International, Inc.
b. Res-X Cure All Resin; Burke Group, LLC (The).
c. RX Cure; Conspec Marketing & Manufacturing Co., Inc.
d. Day-Chem Rez Cure; Dayton Superior Corporation.
e. Kurez DR; Euclid Chemical Co.
f. Nitocure S; Fosroc.
g. #64 Resin Cure; Lambert Corporation.
h. L&M Cure DR; L&M Construction Chemicals, Inc.
i. 3100-Clear; W. R. Meadows, Inc.
j. Seal N Kure FDR; Metalcrete Industries.
k. Rich Cure; Richmond Screw Anchor Co.

l. Resi-Chem C309; Symons Corporation.
m. Horncure 30; Tamms Industries Co., Div. of LaPorte Construction Chemicals North America, Inc.
n. Uni Res 150; Unitex.
o. Certi-Vex RC; Vexcon Chemicals, Inc.

3. Clear Waterborne Membrane-Forming Curing Compound:

a. AH Curing Compound #2 DR WB; Anti-Hydro International, Inc.
b. Aqua Resin Cure; Burke Group, LLC (The).
c. Safe-Cure Clear; ChemMasters.
d. W.B. Resin Cure; Conspec Marketing & Manufacturing Co., Inc.
e. Day Chem Rez Cure (J-11-W); Dayton Superior Corporation.
f. Nitocure S; Fosroc.
g. Aqua Kure-Clear; Lambert Corporation.
h. L&M Cure R; L&M Construction Chemicals, Inc.
i. 1100 Clear; W. R. Meadows, Inc.
j. Resin Cure E; Nox-Crete Products Group, Kinsman Corporation.
k. Rich Cure E; Richmond Screw Anchor Co.
l. Resi-Chem Clear Cure; Symons Corporation.
m. Horncure 100; Tamms Industries Co., Div. of LaPorte Construction Chemicals North America, Inc.
n. Hydro Cure; Unitex.
o. Certi-Vex Enviocure; Vexcon Chemicals, Inc.

4. White Waterborne Membrane-Forming Curing Compound:

a. AH Curing Compound #2 WB WP; Anti-Hydro International, Inc.
b. Aqua Resin Cure; Burke Group, LLC (The).
c. W.B. Resin Cure; Conspec Marketing & Manufacturing Co., Inc.
d. Thinfilm 450; Kaufman Products, Inc.
e. Aqua Kure-White; Lambert Corporation.
f. L&M Cure R-2; L&M Construction Chemicals, Inc.
g. 1200-White; W. R. Meadows, Inc.
h. White Pigmented Resin Cure E; Nox-Crete Products Group, Kinsman Corporation.
i. Rich Cure White E; Richmond Screw Anchor Co.
j. Resi-Chem High Cure; Symons Corporation.
k. Horncure 200-W; Tamms Industries Co., Div. of LaPorte Construction Chemicals North America, Inc.
l. Hydro White 309; Unitex.

2.6 RELATED MATERIALS

A. Expansion- and Isolation-Joint-Filler Strips: Recycled Rubber Equal to ASTM D1752.

B. Pavement-Marking Paint: Latex, water-base emulsion; ready mixed; complying with FS TT-P-1952.

1. Color: As indicated.
2. Color: Blue for handicapped requirements, white elsewhere.
3. Color: Blue for handicapped requirements, yellow for fire lanes, white elsewhere.

C. Wheel Stops: Precast, air-entrained concrete; 2500-psi minimum compressive strength; approximately 6 inches high, 9 inches wide, and 84 inches long. Provide chamfered corners and drainage slots on underside, and provide holes for dowel-anchoring to substrate. See Section 02843 – Parking Bumpers for additional information.

1. Dowels: Galvanized steel, diameter of 3/4 inch, minimum length 10 inches.

D. Slip-Resistive Aggregate Finish: Factory-graded, packaged, rustproof, nonglazing, abrasive aggregate of fused aluminum-oxide granules or crushed emery with emery aggregate containing not less than 50-percent aluminum oxide and not less than 25-percent ferric oxide; unaffected by freezing, moisture, and cleaning materials.

E. Bonding Agent: ASTM C1059, Type II, non-redispersible, acrylic emulsion or styrene butadiene.

F. Epoxy Bonding Adhesive: ASTM C881, two-component epoxy resin, capable of humid curing and bonding to damp surfaces, of class and grade to suit requirements, and as follows:

1. Type II, non-load bearing, for bonding freshly mixed concrete to hardened concrete.
2. Types I and II, non-load bearing, for bonding hardened or freshly mixed concrete to hardened concrete.
3. Types IV and V, load bearing, for bonding hardened or freshly mixed concrete to hardened concrete.

G. Chemical Surface Retarder: Water-soluble, liquid set retarder with color dye, for horizontal concrete surface application, capable of temporarily delaying final hardening of concrete to a depth of 1/8 to 1/4 inch.

H. Available Surface Retarder Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:

1. Chemical Surface Retarder:

a. True Etch Surface Retarder; Burke Group, LLC (The).
b. Exposee; ChemMasters.
c. Delay S; Conspec Marketing & Manufacturing Co., Inc.
d. Concrete Surface Retarders; Euclid Chemical Co.
e. Expose; Kaufman Products, Inc.
f. Surftard; Metalcrete Industries.
g. Crete-Nox TA; Nox-Crete Products Group, Kinsman Corporation.
h. Lithotex; L. M. Scofield Co.
i. Rugasol-S; Sika Corporation.
j. Certi-Vex Envioset; Vexcon Chemicals, Inc.

2.7 CONCRETE MIXES

A. Prepare design mixes, proportioned according to ACI 211.1 and ACI 301, for each type and strength of normal-weight concrete determined by either laboratory trial mixes or field experience methods. For the trial batch method, use a qualified independent testing agency for preparing and reporting proposed mix designs.

1. Do not use the Owner's field quality-control testing agency as the independent testing agency.
2. Limit use of fly ash to 25-percent of cement content by weight.

B. Proportion mixes according to ACI 211.1 and ACI 301 to provide normal-weight concrete with the following properties:

1. Compressive Strength (28 Days): 3,000 psi, typical unless otherwise specified or indicated.
2. Compressive Strength (28 Days): 3,500 psi, where indicated.
3. Compressive Strength (28 Days): 4,000 psi, where indicated.
4. Maximum Water-Cementitious Materials Ratio: 0.45.
5. Slump Limit at Point of Placement: 3-inches.

   a. Slump Limit for Concrete containing High-Range Water-Reducing Admixture (Superplasticizers): Not more than 8-inches after adding admixture to site-verified 2 to 3-inch slump concrete.

C. Cementitious Materials: Limit percentage, by weight, of cementitious materials other than portland cement according to ACI 301 requirements for concrete exposed to deicing chemicals.

D. Cementitious Materials: Limit percentage, by weight, of cementitious materials other than portland cement in concrete as follows:

1. Fly Ash: 25-percent.
2. Combined Fly Ash and Pozzolan: 25-percent.
3. Ground Granulated Blast-Furnace Slag: 50-percent.
4. Combined Fly Ash or Pozzolan, and Ground Granulated Blast-Furnace Slag: 50-percent portland cement minimum, with fly ash or pozzolan not exceeding 25-percent.

E. Admixtures: Add acceptable admixtures as recommended by ACI A211.1 and at rates recommended by manufacturer.

F. Add air-entraining admixture at manufacturer's prescribed rate to result in concrete at point of placement having an air content as follows within a tolerance of plus or minus 1½ -percent:

1. Air Content: 6.0-percent for 1-inch maximum aggregate.*

G. Adjustment to Concrete Mixes: Mix design adjustments may be requested by the Contractor when characteristics of materials, project conditions, weather, test results, or other circumstances warrant.

H. Synthetic Fiber: Uniformly disperse in concrete mix at manufacturer's recommended rate, but not less than 1.5 lb/cu. yd..

2.8 CONCRETE MIXING

A. Ready-Mixed Concrete: Comply with requirements and with ASTM C94 and ASTM C1116.

1. When air temperature is between 85 deg F and 90 deg F, reduce mixing and delivery time from 1-1/2 hours to 75-minutes; when air temperature is above 90 deg F, reduce mixing and delivery time to 60-minutes.

B. Project-Site Mixing: Comply with requirements and measure, batch, and mix concrete materials and concrete according to ASTM C94. Mix concrete materials in appropriate drum-type batch machine mixer, complying with ASTM C685.

1. For mixers of 1 cu. yd. or smaller capacity, continue mixing at least one and one-half minutes, but not more than five minutes after ingredients are in mixer, before any part of batch is released.
2. For mixers of capacity larger than 1 cu. yd., increase mixing time by 15 seconds for each additional 1 cu. yd..
3. Provide batch ticket for each batch discharged and used in the Work, indicating Project identification name and number, date, mix type, mix time, quantity, and amount of water added.

C. Transit Mixers: Comply with ASTM C94.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify compacted subgrade, granular subbase, and or aggregate base course is acceptable and ready to support paving and imposed loads.

B. Verify gradients and elevations of subgrade, granular subbase, and or aggregate base course are correct.

C. Proof-roll prepared subbase and aggregate base course using heavy, pneumatic-tired rollers to locate areas that are unstable or that require further compaction.

D. Notify Architect/Engineer of unsatisfactory conditions. Do not begin paving work until deficient base course areas have been corrected and are ready to receive paving.

3.2 PREPARATION

A. General: Immediately before placing concrete, remove loose and deleterious material from compacted substrate surfaces. Ensure that prepared subgrade is ready to receive paving.

1. Sweep loose granular particles from surface of unbound-aggregate base course. Do not dislodge or disturb aggregate embedded in compacted surface of base course.

3.3 AGGREGATE BASE COURSE

A. See Section 02 72 10 – Aggregate Base Course for the base construction for work of this section.

3.4 EDGE FORMS AND SCREED CONSTRUCTION

A. Set, brace, and secure edge forms, bulkheads, and intermediate screed guides for pavement to required lines, grades, and elevations. Install forms to allow continuous progress of work and so forms can remain in place at least 24-hours after concrete placement.

B. Clean forms after each use and coat with form release agent to ensure separation from concrete without damage.

3.5 STEEL REINFORCEMENT

A. General: Comply with CRSI's "Manual of Standard Practice" for fabricating reinforcement and with recommendations in CRSI's "Placing Reinforcing Bars" for placing and supporting reinforcement.

1. Apply epoxy repair coating to uncoated or damaged surfaces of epoxy-coated reinforcement.

B. Clean reinforcement of loose rust and mill scale, earth, ice, or other bond-reducing materials.

C. Arrange, space, and securely tie bars and bar supports to hold reinforcement in position during concrete placement. Maintain minimum cover to reinforcement.

D. Install welded wire fabric in lengths as long as practicable. Lap adjoining pieces at least one (1) full mesh, and lace splices with wire. Offset laps of adjoining widths to prevent continuous laps in either direction.

E. Install fabricated bar mats in lengths as long as practicable. Handle units to keep them flat and free of distortions. Straighten bends, kinks, and other irregularities, or replace units as required before placement. Set mats for a minimum 2-inch overlap to adjacent mats.

F. Place reinforcement as indicated in the Drawings.

G. Interrupt reinforcement at contraction and expansion joints.

H. Place dowels and/or reinforcement to achieve pavement and curb alignments as detailed.

I. Provide doweled joints at 12-inches on center at interruptions of concrete with one (1) end of dowel set in capped sleeve to allow longitudinal movement.

3.6 JOINTS

A. General: Construct construction, isolation, and contraction joints and tooled edgings true to line with faces, perpendicular to surface plane of concrete. Construct transverse joints at right angles to centerline, unless otherwise indicated.

1. When joining existing pavement, place transverse joints to align with previously placed joints, unless otherwise indicated.

B. Align curb, gutter, and sidewalk joints.

C. Construction Joints: Set construction joints at side and end terminations of pavements and at locations where pavement operations are stopped for more than one-half hour, unless pavement terminates at isolation joints.

1. Provide preformed galvanized steel or plastic keyway-section forms or bulkhead forms with keys, unless otherwise indicated. Embed keys at least 1-1/2 inches into concrete.
2. Continue reinforcement across construction joints, unless otherwise indicated. Do not continue reinforcement through sides of strip paving, unless otherwise indicated.
3. Provide tie bars at sides of paving strips where indicated.
4. Use a bonding agent at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.

5. Use epoxy bonding adhesive at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.

D. Isolation/Expansion Joints: Form isolation joints of preformed joint-filler strips abutting concrete curbs, catch basins, manholes, inlets, structures, walks, other fixed objects, and where indicated.

1. Place ½-inch wide joints at intervals indicated on the Drawings and to separate paving from vertical surfaces and other components.
2. Locate expansion joints where and in pattern indicated.
3. Locate expansion joints at maximum intervals of 20 feet, unless otherwise indicated.
4. Form joints with joint filler extending from bottom of pavement.
5. Extend joint fillers full width and depth of joint.

   a. Terminate joint filler not less than 1/2 inch or more than 1 inch below finished surface if joint sealant is indicated.
   b. Place top of filler flush with finished concrete surface when no joint sealant is indicated.

6. Furnish joint fillers in one-piece lengths for full width being placed whenever possible.

   a. Where more than one length is required, lace or clip joint-filler sections together.

7. Protect top edge of joint filler during concrete placement with metal, plastic, or other temporary preformed cap. Remove protective cap after concrete has been placed on both sides of joint.
8. Secure joint filler to resist movement by wet concrete.

E. Install dowel bars and support assemblies at joints where indicated. Lubricate or asphalt-coat one-half of dowel length to prevent concrete bonding to one side of joint.

F. Contraction Joints: Provide weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth of the concrete thickness, as follows:

1. Tooled Joints: Form contraction joints after initial floating by grooving and finishing each edge of joint with a radiused jointer tool of the following radius. Repeat grooving of contraction joints after applying surface finishes. Eliminate tool marks on concrete surfaces.

   a. Radius: 1/4 inch.

2. Sawed Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch- wide joints into hardened concrete when cutting action will not tear, abrade, or otherwise damage surface and before development of random contraction cracks.

   a. Cut 1/3 into depth of pavement.

G. Edging: Tool edges of pavement, gutters, curbs, and joints in concrete after initial floating with an edging tool of the following radius. Repeat tooling of edges after applying surface finishes. Eliminate tool marks on concrete surfaces.

1. Radius: 1/4 inch.

3.7 CONCRETE PLACEMENT

A. Inspection: Before placing concrete, inspect and complete formwork installation, reinforcing steel, and items to be embedded or cast-in. Notify other trades to permit installation of their work.

B. Remove snow, ice, or frost from substrate surface and reinforcing before placing concrete. Do not place concrete on frozen surfaces.

C. Moisten substrate to provide a uniform dampened condition at the time concrete is placed. Do not place concrete around manholes, grilles or frames, or other structures until they are at the required finish elevation and alignment.

D. Comply with requirements and with recommendations in ACI 304R for measuring, mixing, transporting, and placing concrete.

E. Do not add water to concrete during delivery, at Project site, or during placement.

F. Deposit and spread concrete in a continuous operation between transverse joints. Do not push or drag concrete into place or use vibrators to move concrete into place.

1. When concrete placement is interrupted for more than ½-hour, place a construction joint.
2. Use a bonding agent at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.

G. Consolidate concrete by mechanical vibrating equipment supplemented by hand-spading, rodding, or tamping. Use equipment and procedures to consolidate concrete according to recommendations in ACI 309R.

1. Consolidate concrete along face of forms and adjacent to transverse joints with an internal vibrator. Keep vibrator away from joint assemblies, reinforcement, or side forms. Use only square-faced shovels for hand-spreading and consolidation. Consolidate with care to prevent dislocating reinforcement, dowels, and joint devices.

H. Screed paved surfaces with a straightedge and strike off. Commence initial floating using bull floats or darbies to form an open-textured and uniform, smooth surface plane before excess moisture or bleed water appears on the surface. Do not further disturb concrete surfaces before beginning finishing operations.

I. When adjoining pavement lanes are placed in separate pours, do not operate equipment on concrete until pavement has attained 85-percent of its 28-day compressive strength.

J. Cold-Weather Placement: Comply with ACI 306.1 and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.

1. When air temperature has fallen to or is expected to fall below 40 deg F, uniformly heat water and aggregates before mixing to obtain a concrete mixture temperature of not less than 50 deg F and not more than 80 deg F at point of placement.
2. Do not use frozen materials or materials containing ice or snow.
3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators, unless otherwise specified and approved in mix designs.

K. Hot-Weather Placement: Place concrete according to recommendations in ACI 305R and as follows when hot-weather conditions exist:

1. Cool ingredients before mixing to maintain concrete temperature at time of placement below 90 deg F. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.
2. Cover reinforcement steel with water-soaked burlap so steel temperature will not exceed ambient air temperature immediately before embedding in concrete.
3. Fog-spray forms, reinforcement steel, and subgrade just before placing concrete. Keep subgrade moisture uniform without standing water, soft spots, or dry areas.

3.8 CONCRETE FINISHING

A. General: Wetting of concrete surfaces during screeding, initial floating, or finishing operations is prohibited.

B. Float Finish: Begin the second floating operation when bleed-water sheen has disappeared and the concrete surface has stiffened sufficiently to permit operations. Float surface with power-driven floats, or by hand floating if area is small or inaccessible to power units. Finish surfaces to true planes within a tolerance of ¼-inch in 10-feet as determined by a 10-foot-long straightedge placed anywhere on the surface in any direction. Cut down high spots and fill low spots. Refloat surface immediately to uniform granular texture.

1. Burlap Finish: Drag a seamless strip of damp burlap across float-finished concrete, perpendicular to line of traffic, to provide a uniform, gritty texture.
2. Medium-to-Fine-Textured Broom Finish: Draw a soft bristle broom across float-finished concrete surface perpendicular to line of traffic to provide a uniform, fine-line texture.
3. Medium-to-Coarse-Textured Broom Finish: Provide a coarse finish by striating float-finished concrete surface 1/16 to 1/8 inch deep with a stiff-bristled broom, perpendicular to line of traffic.

C. Final Tooling: Tool edges of paving, curbs, gutters, and joints formed in fresh concrete with a jointing tool of the following radius. Repeat tooling of edges and joints after applying surface finishes. Eliminate tool marks on concrete surfaces.

1. Radius: ¼-inch.

D. Finishing Schedule:

1. Area Paving: Light Broom Finish and tool edges.
2. Sidewalk Paving: Light Broom Finish, radius exposed raised edges to ½-inch radius, and tool edges.
3. Curbs and Gutters: Light Broom Finish and tool edges.
4. Inclined Vehicular Ramps: Course Broomed perpendicular to slope.
5. Inclined Handicapped Ramps: Course Broomed perpendicular to slope or V-Jointed perpendicular to slope.
6. Exterior Steps-on-Grade: Course Broom Finish or Slip-Resistant Aggregate Finish.

E. Place curing compound or sealer on exposed surfaces immediately after finishing. Apply in accordance with manufacturer's instructions.

3.9 CONCRETE PROTECTION AND CURING

A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and follow recommendations in ACI 305R for hot-weather protection during curing.

B. Evaporation Retarder: Apply evaporation retarder to concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing.

C. Curing: Begin curing after finishing concrete, but not before free water has disappeared from concrete surface.

D. Curing Methods: Cure concrete by moisture curing, moisture-retaining-cover curing, curing compound, or a combination of these as follows:

1. Moisture Curing: Keep surfaces continuously moist for not less than 7-days with the following materials:

   a. Water.
   b. Continuous water-fog spray.
   c. Absorptive cover, water saturated, and kept continuously wet. Cover concrete surfaces and edges with 12-inch lap over adjacent absorptive covers.

2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches, and sealed by waterproof tape or adhesive. Immediately repair any holes or tears during curing period using cover material and waterproof tape.
3. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within 3-hours after initial application. Maintain continuity of coating and repair damage during curing period.

3.10 REMOVAL OF FORMS AND SUPPORTS

A. Provided that concrete has hardened sufficiently that it will not be damaged, forms may be removed after concrete has cured at not less than 50 deg F for 8-hours. Maintain curing and protection operations after form removal.

B. Perform structural repairs with prior approval of the Architect/Engineer for method and procedure, using epoxy-bonding systems. The Architect/Engineer's approval is required for repair methods using materials other than those specified.

3.11 PAVEMENT TOLERANCES

A. Comply with tolerances of ACI 117 and as follows:

1. Elevation: 1/4 inch.
2. Thickness: Plus 3/8 inch.
3. Surface: Gap below 10-foot- long, unleveled straightedge not to exceed 1/4 inch.
4. Lateral Alignment and Spacing of Tie Bars and Dowels: 1 inch.
5. Vertical Alignment of Tie Bars and Dowels: 1/4 inch.
6. Alignment of Tie-Bar End Relative to Line Perpendicular to Pavement Edge: 1/2 inch.

7. Alignment of Dowel-Bar End Relative to Line Perpendicular to Pavement Edge: Length of dowel 1/4 inch per 12 inches.
8. Joint Spacing: 3 inches.
9. Contraction Joint Depth: Plus 1/4 inch, no minus.
10. Joint Width: Plus 1/8 inch, no minus.

3.12 PAVEMENT MARKING

A. Do not apply pavement-marking paint until layout, colors, and placement have been verified with Architect/Engineer.

B. Allow concrete pavement to cure for 28-days and be dry before starting pavement marking.

C. Sweep and clean surface to eliminate loose material and dust.

D. Apply paint with mechanical equipment to produce pavement markings of dimensions indicated with uniform, straight edges. Apply at manufacturer's recommended rates to provide a minimum wet film thickness of 15 mils.

1. Broadcast glass spheres uniformly into wet pavement markings at a rate of 6 lb/gal..

3.13 FIELD QUALITY CONTROL

A. An independent testing agency will perform field quality control tests as specified in Division 1 Specification Sections and this Section. The Contractor shall coordinate with testing agency and perform the following:

1. Provide free access to concrete operations at project site and cooperate with appointed firm.
2. Submit proposed mix design of each class of concrete to testing firm for review prior to commencement of concrete operations.
3. Tests of concrete and concrete materials may be performed at any time to ensure conformance with specified requirements.

B. Testing Agency: The Owner will engage a qualified testing and inspection agency to sample materials, perform tests, and submit test reports during concrete placement. Sampling and testing for quality control may include those specified in this Article.

C. Testing Services: Testing shall be performed according to the following requirements:

1. Sampling Fresh Concrete: Representative samples of fresh concrete shall be obtained according to ASTM C172, except modified for slump to comply with ASTM C94.
2. Slump: ASTM C 143; one (1) test at point of placement for each compressive-strength test, but not less than one (1) test for each day's pour of each type of concrete. Additional tests will be required when concrete consistency changes.
3. Air Content: ASTM C231, pressure method; one (1) test for each compressive-strength test, but not less than one (1) test for each day's pour of each type of air-entrained concrete.
4. Concrete Temperature: ASTM C1064; one (1) test hourly when air temperature is 40 deg F and below and when 80 deg F and above, and one (1) test for each set of compressive-strength specimens.

5. Compression Test Specimens: ASTM C31; one (1) set of four standard cylinders for each compressive-strength test, unless otherwise indicated. Cylinders shall be molded and stored for laboratory-cured test specimens unless field-cured test specimens are required.
6. Compressive-Strength Tests: ASTM C39; one (1) set for each day's pour of each concrete class exceeding 5-cu. yd., but less than 25-cu. yd., plus one (1) set for each additional 50-cu. yd.. One (1) specimen shall be tested at 7-days and two (2) specimens at 28-days; one (1) specimen shall be retained in reserve for later testing if required.
7. When frequency of testing will provide fewer than five (5) compressive-strength tests for a given class of concrete, testing shall be conducted from at least five (5) randomly selected batches or from each batch if fewer than five (5) are used.
8. When total quantity of a given class of concrete is less than 50-cu. yd., Architect/Engineer may waive compressive-strength testing if adequate evidence of satisfactory strength is provided.
9. When strength of field-cured cylinders is less than 85-percent of companion laboratory-cured cylinders, current operations shall be evaluated and corrective procedures shall be provided for protecting and curing in-place concrete.
10. Strength level of concrete will be considered satisfactory if averages of sets of three (3) consecutive compressive-strength test results equal or exceed specified compressive strength and no individual compressive-strength test result falls below specified compressive strength by more than 500 psi.

D. Test results shall be reported in writing to the Architect/Engineer, concrete manufacturer, and Contractor within 24-hours of testing. Reports of compressive-strength tests shall contain Project identification name and number, date of concrete placement, name of concrete testing agency, concrete type and class, location of concrete batch in pavement, design compressive strength at 28-days, concrete mix proportions and materials, compressive breaking strength, and type of break for both 7- and 28-day tests.

E. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by the Architect/Engineer but will not be used as the sole basis for approval or rejection.

F. Additional Tests: Testing agency shall make additional tests of the concrete when test results indicate slump, air entrainment, concrete strengths, or other requirements have not been met, as directed by the Architect/Engineer. Testing agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C42, or by other methods as directed.

3.14 REPAIRS AND PROTECTION

A. Remove and replace concrete pavement that is broken, damaged, or defective, or does not meet requirements in this Section.

B. Drill test cores where directed by the Architect/Engineer when necessary to determine magnitude of cracks or defective areas. Fill drilled core holes in satisfactory pavement areas with portland cement concrete bonded to pavement with epoxy adhesive.

C. Protect concrete from damage. Exclude traffic from pavement for at least 14-days after placement. When construction traffic is permitted, maintain pavement as clean as possible by removing surface stains and spillage of materials as they occur.

D. Maintain concrete pavement free of stains, discoloration, dirt, and other foreign material. Sweep concrete pavement not more than two days before date scheduled for Substantial Completion inspections.

END OF SECTION 32 13 13

SECTION 32 13 73 – CONCRETE PAVING JOINT SEALANTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Expansion and contraction joints within cement concrete pavement.
2. Joints between cement concrete and asphalt pavement.

1.3 SUBMITTALS

A. Product Data: For each joint-sealant product indicated.

B. Product Certificates: For each type of joint sealant and accessory, signed by product manufacturer.

1. Materials forming joint substrates and joint-sealant backings have been tested for compatibility and adhesion with joint sealants.
2. Interpretation of test results and written recommendations for primers and substrate preparation needed for adhesion.

C. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for sealants.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: An employer of workers trained and approved by manufacturer.

B. Source Limitations: Obtain each type of joint sealant through one source from a single manufacturer.

C. Product Testing: Obtain test results for "Product Test Reports" Paragraph in "Submittals" Article from a qualified testing agency based on testing of current sealant products within a 36-month period preceding the commencement of the Work.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to Project site in original unopened containers or bundles with labels indicating manufacturer, product name and designation, color, expiration date, pot life, curing time, and mixing instructions for multicomponent materials.

B. Store and handle materials to comply with manufacturer's written instructions to prevent their deterioration or damage due to moisture, high or low temperatures, contaminants, or other causes.

1.6 PROJECT CONDITIONS

A. Do not proceed with installation of joint sealants under the following conditions:

1. When ambient and substrate temperature conditions are outside limits permitted by joint-sealant manufacturer.
2. When ambient and substrate temperature conditions are outside limits permitted by joint-sealant manufacturer or are below 40 deg F (4.4 deg C).
3. When joint substrates are wet or covered with frost.
4. Where joint widths are less than those allowed by joint-sealant manufacturer for applications indicated.
5. Where contaminants capable of interfering with adhesion have not yet been removed from joint substrates.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, products listed in other Part 2 articles.

2.2 MATERIALS, GENERAL

A. Compatibility: Provide joint sealants, backing materials, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by joint-sealant manufacturer based on testing and field experience.

B. Colors of Exposed Joint Sealants: As selected by Architect from manufacturer's full range.

2.3 COLD-APPLIED JOINT SEALANTS

A. Multicomponent Jet-Fuel-Resistant Sealant for Concrete: Pourable, chemically curing elastomeric formulation complying with the following requirements for formulation and with ASTM C 920 for type, grade, class, and uses indicated:

1. Urethane Formulation: Type M; Grade P; Class 12-1/2; Uses T, M, and, as applicable to joint substrates indicated, O.
2. Coal-Tar-Modified Polymer Formulation: Type M; Grade P; Class 25; Uses T and, as applicable to joint substrates indicated, O.

3. Bitumen-Modified Urethane Formulation: Type M; Grade P; Class 25; Uses T, M, and, as applicable to joint substrates indicated, O.

B. Single-Component Jet-Fuel-Resistant Urethane Sealant for Concrete: Single-component, pourable, coal-tar-modified, urethane formulation complying with ASTM C 920 for Type S; Grade P; Class 25; Uses T, M, and, as applicable to joint substrates indicated, O.

C. Type NS Silicone Sealant for Concrete: Single-component, low-modulus, neutral-curing, nonsag silicone sealant complying with ASTM D 5893 for Type NS.

D. Type SL Silicone Sealant for Concrete and Asphalt: Single-component, low-modulus, neutral-curing, self-leveling silicone sealant complying with ASTM D 5893 for Type SL.

E. Multicomponent Low-Modulus Sealant for Concrete and Asphalt: Proprietary formulation consisting of reactive petropolymer and activator components producing a pourable, self-leveling sealant.

2.4 HOT-APPLIED JOINT SEALANTS

A. Jet-Fuel-Resistant Elastomeric Sealant for Concrete: Single-component formulation complying with ASTM D 3569.

B. Jet-Fuel-Resistant Sealant for Concrete and Tar Concrete: Single-component formulation complying with ASTM D 3581.

C. Elastomeric Sealant for Concrete: Single-component formulation complying with ASTM D 3406.

D. Sealant for Concrete and Asphalt: Single-component formulation complying with ASTM D 3405.

2.5 JOINT-SEALANT BACKER MATERIALS

A. General: Provide joint-sealant backer materials that are nonstaining; are compatible with joint substrates, sealants, primers, and other joint fillers; and are approved for applications indicated by joint-sealant manufacturer based on field experience and laboratory testing.

B. Round Backer Rods for Cold- and Hot-Applied Sealants: ASTM D 5249, Type 1, of diameter and density required to control sealant depth and prevent bottom-side adhesion of sealant.

C. Backer Strips for Cold- and Hot-Applied Sealants: ASTM D 5249; Type 2; of thickness and width required to control sealant depth, prevent bottom-side adhesion of sealant, and fill remainder of joint opening under sealant.

D. Round Backer Rods for Cold-Applied Sealants: ASTM D 5249, Type 3, of diameter and density required to control sealant depth and prevent bottom-side adhesion of sealant.

2.6 PRIMERS

A. Primers: Product recommended by joint-sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint-sealant-substrate tests and field tests.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine joints indicated to receive joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting joint-sealant performance.

1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with joint-sealant manufacturer's written instructions.

B. Joint Priming: Prime joint substrates where indicated or where recommended in writing by joint-sealant manufacturer, based on preconstruction joint-sealant-substrate tests or prior experience. Apply primer to comply with joint-sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.

3.3 INSTALLATION OF JOINT SEALANTS

A. General: Comply with joint-sealant manufacturer's written installation instructions for products and applications indicated, unless more stringent requirements apply.

B. Sealant Installation Standard: Comply with recommendations in ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.

C. Install backer materials of type indicated to support sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.

1. Do not leave gaps between ends of backer materials.
2. Do not stretch, twist, puncture, or tear backer materials.
3. Remove absorbent backer materials that have become wet before sealant application and replace them with dry materials.

D. Install sealants using proven techniques that comply with the following and at the same time backings are installed:

1. Place sealants so they directly contact and fully wet joint substrates.
2. Completely fill recesses provided for each joint configuration.
3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.

E. Tooling of Nonsag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants according to requirements specified below to form smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint.

1. Remove excess sealants from surfaces adjacent to joint.

2. Use tooling agents that are approved in writing by joint-sealant manufacturer and that do not discolor sealants or adjacent surfaces.

F. Provide joint configuration to comply with joint-sealant manufacturer's written instructions, unless otherwise indicated.

G. Provide recessed joint configuration for silicone sealants of recess depth and at locations indicated.

3.4 CLEANING

A. Clean off excess sealants or sealant smears adjacent to joints as the Work progresses by methods and with cleaning materials approved by manufacturers of joint sealants and of products in which joints occur.

3.5 PROTECTION

A. Protect joint sealants during and after curing period from contact with contaminating substances and from damage resulting from construction operations or other causes so sealants are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated joint sealants immediately and replace with joint sealant so installations with repaired areas are indistinguishable from the original work.

END OF SECTION 32 13 73

DIVISION 33 – UTILITIES

SECTION 33 41 00 - STORM UTILITY DRAINAGE PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Storm drainage culvert, collections, and main system piping, fittings, and accessories
2. Connection of Storm Drainage Collector System to building storm drainage systems, building downspout drains, and Storm Drainage Main System.

1.3 LEED BUILDING GENERAL REQUIREMENTS

A. The University of South Carolina requires the Contractor to implement practices and procedures to meet the project's environmental performances goals, which include achieving LEED Certification. Specific project goals that may impact this area of work include: use of recycled-content materials; use of locally-manufactured materials; use of low-emitting materials; construction waste recycling; and the implementation of a construction indoor air quality management plan. The Contractor shall ensure that the requirements related to these goals, as defined in the sections below, are implemented to the fullest extent. Substitutions shall not be allowed if such changes comprise the stated LEED BUILDING Performance Criteria.

1.4 REFERENCES

A. AASHTO M 252 (latest edition).

B. AASHTO M 294 (latest edition).

C. ASTM A74 – Standard Specification for Cast-Iron Soil Pipe and Fittings; 1998.

D. ASTM C14 – Standard Specification for Concrete Sewer, Storm Drain, and Culvert Pipe ; 1999.

E. ASTM C76 – Standard Specification for Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe ; 1999a.

F. ASTM C443 – Standard Specification for Joints in Circular Concrete Sewer and Culvert Pipe, Using Rubber Gaskets ; 1998.

G. ASTM C564 – Standard Specification for Rubber Gaskets for Cast-Iron Soil Pipe and Fittings; 1997.

H. ASTM C990 – Specification for Joints for Concrete Pipe Manholes and Precast Box Sections Using Preformed Flexible Joint Sealants.

I. ASTM D1785 – Standard Specification for Poly (Vinyl Chloride) (PVC) Plastic Pipe, Schedule 40, 80, and 120; 1999.

J. ASTM D2321 – Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications; 1989 (Re-Approved 1995).

K. ASTM D2412 (latest edition).

L. ASTM D2729 – Standard Specification for Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings; 1996a.

M. ASTM D2751 – Standard Specification for Acrylonitrile-Butadiene-Styrene (ABS) Sewer Pipe and Fittings; 1996a.

N. ASTM D3034 – Standard Specification for Type PSM Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings; 1998.

O. ASTM F447 (latest edition).

1.5 DEFINITIONS

A. Bedding: Fill placed under, beside, and directly over pipe, prior to subsequent backfill operations.

B. ABS: Acrylonitrile-butadiene-styrene plastic.

C. EPDM: Ethylene-propylene-diene-monomer rubber.

D. PE: Polyethylene plastic.

E. PVC: Polyvinyl chloride plastic.

1.6 PERFORMANCE REQUIREMENTS

A. Gravity-Flow, Nonpressure-Piping Pressure Ratings: At least equal to system test pressure.

1.7 SUBMITTALS

A. See Division 1 Specification Sections for submittal procedures.

B. Product Data: For the following:

1. Piping, Pipe Fittings, and Accessories.
2. Stormwater cleanouts.

C. Manufacturer's Installation Instructions: Indicate special procedures required to install Products specified.

D. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

E. Coordination Drawings: Show basins and other structures, pipe sizes, locations, and elevations. Include details of underground structures and connections. Show other piping in same trench

and clearances from sanitary sewerage system piping. Indicate interface and spatial relationship between piping and proximate structures.

F. Design Mix Reports and Calculations: For each class of cast-in-place concrete.

G. Field Test Reports: Indicate and interpret test results for compliance with performance requirements.

H. Project Record Documents: Survey location of pipe runs, catch basins, junction boxes, outlet structures and corresponding invert elevations

1. The Contractor shall submit to the Architect/Engineer, prior to substantial completion, a record survey in digital DWG format.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Do not store plastic structures, pipe, and fittings in direct sunlight.

B. Protect pipe, pipe fittings, and seals from dirt and damage.

1.9 PROJECT CONDITIONS

A. Site Information: Perform site survey, research public utility records, and verify existing utility locations.

B. Locate existing structures and piping to be closed and abandoned.

C. Existing Utilities: Do not interrupt utilities serving facilities occupied by the Owner or others unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:

1. Notify the Architect/Engineer not less than two (2) days in advance of proposed utility interruptions.
2. Do not proceed with utility interruptions without Architect/Engineer's written permission.

D. Verify existing pipe sizes and invert elevations at tie-in points before commencing installation of pipe. Notify the Architect/Engineer immediately upon discovering any discrepancies from inverts shown on the Drawings.

E. Coordinate the Work with termination of storm sewer connections outside building, trenching, connection to building downspout drains, connection to foundation drainage system and connection to existing site storm drainage system.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Gray-Iron Cleanouts:

a. Josam Co.
b. McWane, Inc.; Tyler Pipe; Wade Div.
c. MIFAB.
d. Smith: Jay R. Smith Mfg. Co.
e. Watts Industries, Inc.; Ancon Drain Div.
f. Watts Industries, Inc.; Enpoco, Inc. Div.
g. Zurn Industries, Inc.; Hydromechanics Div.
h. Or equal.

2. PVC Cleanouts:

a. Canplas, Inc.
b. IPS Corp.
c. NDS, Inc.
d. Plastic Oddities, Inc.
e. Sioux Chief Manufacturing Co., Inc.
f. Or equal.

2.2 PIPING MATERIALS

A. Refer to Part 3 "Piping Applications" Article for applications of pipe and fitting materials.

2.3 PIPES AND FITTINGS – CULVERTS

A. Reinforced-Concrete Sewer Pipe and Fittings: ASTM C76, Class III, Wall Type B.

1. Joint Devices: ASTM C990, Preformed Flexible Joint Sealant.
2. Acceptable Nominal Pipe Sizes: 12" to 144".
3. Watertight joints.

2.4 PIPES AND FITTINGS

A. Ductile-Iron Sewer Pipe: ASTM A746, for push-on joints.

1. Standard-Pattern, Ductile-Iron Fittings: AWWA C110, ductile or gray iron, for push-on joints.
2. Compact-Pattern, Ductile-Iron Fittings: AWWA C153, for push-on joints.
3. Gaskets: AWWA C111, rubber.
4. Acceptable Nominal Pipe Sizes: 4" to 12".

B. ABS Sewer Pipe and Fittings: ASTM D2751, SDR 42, for gasketed joints.

1. Gaskets: ASTM F477, elastomeric seals.
2. Acceptable Nominal Pipe Sizes: 4" to 12".

C. Corrugated HDPE Drainage Tubing and Fittings: AASHTO M252, Type S, with smooth waterway for coupling joints.

1. Silttight Couplings: PE sleeve with ASTM D1056, Type 2, Class A, Grade 2 gasket material that mates with tube and fittings to form silttight joints.
2. Acceptable Nominal Pipe Sizes: 4" to 10".

D. HDPE Plastic Pipe and Fittings: Corrugated high density polyethylene pipe; AASHTO M252, AASHTO M294 & ASTM D2412, and ASTM F477, Type S, Dual wall, Smooth core, bell and spigot end joints.

1. HDPE Plastic Pipe Joint Devices: ASTM F477 rubber compression gasket joint devices. Rubber gaskets are to be covered with a protective removable wrap.
2. Acceptable Nominal Pipe Sizes: 6" to 24".
3. Watertight joints.

E. PVC Sewer Pipe and Fittings: ASTM D3034, SDR 35, for solvent-cemented or gasketed joints.

1. Gaskets: ASTM F477, elastomeric seals.
2. Acceptable Nominal Pipe Sizes: 4" to 15".

2.5 MANHOLES (JUNCTION BOXES)

A. Normal-Traffic Precast Concrete Manholes: ASTM C478, precast, reinforced concrete, of depth indicated, with provision for rubber gasketed joints.

1. Diameter: 48-inches minimum, unless otherwise indicated.
2. Ballast: Increase thickness of precast concrete sections or add concrete to base section, as required to prevent flotation.
3. Base Section: 6-inch minimum thickness for floor slab and 4-inch minimum thickness for walls and base riser section, and having separate base slab or base section with integral floor.
4. Riser Sections: 4-inch minimum thickness, and lengths to provide depth indicated.
5. Top Section: Eccentric-cone type, unless concentric-cone or flat-slab-top type is indicated. Top of cone of size that matches grade rings.
6. Gaskets: ASTM C443, rubber.
7. Grade Rings: Include two or three reinforced-concrete rings, of 6- to 9-inch total thickness, that match 24-inch-diameter frame and cover.
8. Steps: Fiberglass, individual steps or ladder. Include width that allows worker to place both feet on one step and is designed to prevent lateral slippage off step. Cast or anchor into base, riser, and top section sidewalls with steps at 12- to 16-inch intervals. Omit steps for manholes less than 60-inches deep.
9. Steps: Manufactured from deformed, 1/2-inch steel reinforcement rod complying with ASTM A615 and encased in polypropylene complying with ASTM D4101. Include pattern designed to prevent lateral slippage off step. Cast or anchor into sidewalls with steps at 12- to 16-inch intervals. Omit steps for manholes less than 60-inches deep.
10. Steps: ASTM C478, individual steps or ladder. Omit steps for manholes less than 60-inches deep.
11. Pipe Connectors: ASTM C923, resilient, of size required, for each pipe connecting to base section.

B. Heavy-Traffic Precast Concrete Manholes: ASTM C913; designed according to ASTM C890 for A-16, heavy-traffic, structural loading; of depth, shape, and dimensions indicated, with provision for rubber gasketed joints.

1. Ballast: Increase thickness of one or more precast concrete sections or add concrete to structure, as required to prevent flotation.
2. Gaskets: Rubber.
3. Grade Rings: Include two or three reinforced-concrete rings, of 6- to 9-inch total thickness, that match 24-inch- diameter frame and cover.

4. Steps: Fiberglass, individual steps or ladder. Include width that allows worker to place both feet on one step and is designed to prevent lateral slippage off step. Cast or anchor into base, riser, and top section sidewalls with steps at 12- to 16-inch intervals. Omit steps for manholes less than 60-inches deep.
5. Steps: Manufactured from deformed, 1/2-inch steel reinforcement rod complying with ASTM A615 and encased in polypropylene complying with ASTM D4101. Include pattern designed to prevent lateral slippage off step. Cast or anchor into sidewalls with steps at 12- to 16-inch intervals. Omit steps for manholes less than 60-inches deep.
6. Steps: ASTM C478, individual steps or ladder. Omit steps for manholes less than 60-inches deep.
7. Pipe Connectors: ASTM C923, resilient, of size required, for each pipe connecting to base section.

C. Manhole Frames and Covers: ASTM A536, Grade 60-40-18, ductile-iron castings designed for heavy-duty service. Include 24-inch ID by 7- to 9-inch riser with 4-inch minimum width flange, and 26-inch-diameter cover. Include indented top design with lettering "STORM SEWER" cast into cover.

D. Manholes are to be sized such that the clearance between the outside wall of pipe and the adjacent interior walls of structure is a minimum of 9-inches.

E. Cut-off pipes at manholes flush with interior face of manhole wall to match the shape of the manhole wall.

2.6 CATCH BASINS

A. Normal-Traffic, Precast Concrete Catch Basins: ASTM C478, precast, reinforced concrete, of depth indicated, with provision for rubber gasketed joints.

1. Base Section: 6-inch minimum thickness for floor slab and 4-inch minimum thickness for walls and base riser section, and having separate base slab or base section with integral floor.
2. Riser Sections: 4-inch minimum thickness, 48-inch diameter, and lengths to provide depth indicated.
3. Top Section: Eccentric-cone type, unless concentric-cone or flat-slab-top type is indicated. Top of cone of size that matches grade rings.
4. Gaskets: ASTM C443, rubber.
5. Grade Rings: Include two or three reinforced-concrete rings, of 6- to 9-inch total thickness, that match frame and grate.
6. Steps: Fiberglass, individual steps or ladder. Include width that allows worker to place both feet on one step and is designed to prevent lateral slippage off step. Cast steps or anchor ladder into base, riser, and top section sidewalls at 12- to 16-inch intervals. Omit steps for catch basins less than 60-inches deep.
7. Steps: Manufactured from deformed, 1/2-inch steel reinforcement rod complying with ASTM A615 and encased in polypropylene complying with ASTM D4101. Include pattern designed to prevent lateral slippage off step. Cast or anchor into sidewalls with steps at 12- to 16-inch intervals. Omit steps for manholes less than 60-inches deep.
8. Steps: ASTM C478, individual steps or ladder. Omit steps for catch basins less than 60-inches deep.
9. Pipe Connectors: ASTM C923, resilient, of size required, for each pipe connecting to base section.

B. Heavy-Traffic, Precast Concrete Catch Basins: ASTM C913, precast, reinforced concrete; designed according to ASTM C890 for A-16, heavy-traffic, structural loading; of depth, shape, and dimensions indicated, with provision for rubber gasketed joints.

1. Gaskets: Rubber.
2. Grade Rings: Include two or three reinforced-concrete rings, of 6- to 9-inch total thickness, that match frame and grate.
3. Steps: Fiberglass, individual steps or ladder. Include width that allows worker to place both feet on one step and is designed to prevent lateral slippage off step. Cast steps or anchor ladder into base, riser, and top section sidewalls at 12- to 16-inch intervals. Omit steps for catch basins less than 60-inches deep.
4. Steps: Manufactured from deformed, 1/2-inch steel reinforcement rod complying with ASTM A615 and encased in polypropylene complying with ASTM D4101. Include pattern designed to prevent lateral slippage off step. Cast or anchor into sidewalls with steps at 12- to 16-inch intervals. Omit steps for manholes less than 60-inches deep.
5. Steps: ASTM C478, individual steps or ladder. Omit steps for catch basins less than 60-inches deep.
6. Pipe Connectors: ASTM C923, resilient, of size required, for each pipe connecting to base section.

C. Pipe Connectors: ASTM C923, resilient, of size required, for each pipe connecting to base section.

D. Frames and Grates: ASTM A536, Grade 60-40-18, ductile iron designed for heavy-duty service. Include flat grate with small square or short-slotted drainage openings.

1. Size: 24 x 24-inches minimum, unless otherwise indicated.
2. Grate Free Area: Approximately 50-percent, unless otherwise indicated.

E. Frames and Grates: ASTM A536, Grade 60-40-18, ductile iron designed for heavy-duty service. Include 24-inch ID by 7- to 9-inch riser with 4-inch minimum width flange, and 26-inch-diameter flat grate with small square or short-slotted drainage openings.

1. Grate Free Area: Approximately 50-percent, unless otherwise indicated.

F. Catch basins are to be sized such that the clearance between the outside wall of pipe and the adjacent interior walls of structure is a minimum of 9-inches.

G. Cut-off pipes at catch basins flush with interior face of manhole wall to match the shape of the manhole wall.

2.7 STORMWATER INLETS

A. Drop Inlets: Horizontal gutter opening, of materials and dimensions indicated. Include heavy-duty frames and grates.

B. Combination Curb Inlets: Vertical curb and horizontal gutter openings, of materials and dimensions indicated. Include heavy-duty frames and grates.

C. Frames and Grates: Dimensions, opening pattern, free area, and other attributes indicated.

1. Material: ASTM A536, Grade 60-40-18 minimum, ductile-iron casting.
2. Material: ASTM A48, Class 30 minimum, gray-iron casting.
3. Grate Free Area: Approximately 50-percent, unless otherwise indicated.

2.8 CONCRETE

A. General: Cast-in-place concrete according to ACI 318, ACI 350R, and the following:

1. Cement: ASTM C150, Type II.
2. Fine Aggregate: ASTM C33, sand.
3. Coarse Aggregate: ASTM C33, crushed gravel.
4. Water: Potable.

B. Portland Cement Design Mix: 4,000 psi minimum, with 0.45 maximum water-cementitious ratio.

C. Reinforcement Fabric: ASTM A185, steel, welded wire fabric, plain.

D. Reinforcement Bars: ASTM A615, Grade 60, deformed steel.

E. Structure Channels and Benches: Factory or field formed from concrete. Portland cement design mix, 4,000 psi minimum, with 0.45 maximum water-cementitious ratio.

F. Ballast and Pipe Supports: Portland cement design mix, 3,000 psi minimum, with 0.58 maximum water-cementitious ratio.

1. Reinforcement Fabric: ASTM A185, steel, welded wire fabric, plain.
2. Reinforcement Bars: ASTM A615, Grade 60, deformed steel.

2.9 PROTECTIVE COATINGS

A. Description: One- or two-coat, coal-tar epoxy; 15-mil minimum thickness, unless otherwise indicated; factory or field applied to the following surfaces:

1. Manhole Frames and Covers: On entire surfaces.
2. Catch Basin Frames and Grates: On entire surfaces.
3. Stormwater Inlet Frames and Grates: On entire surfaces.

2.10 CLEANOUTS

A. Gray-Iron Cleanouts: ASME A112.36.2M, round, gray-iron housing with clamping device and round, secured, scoriated, gray-iron cover. Include gray-iron ferrule with inside calk or spigot connection and countersunk, tapered-thread, brass closure plug. Use units with top-loading classifications according to the following applications:

1. Light Duty: In earth or grass foot-traffic areas.
2. Medium Duty: In paved foot-traffic areas.
3. Heavy Duty: In vehicle-traffic service areas.
4. Extra-Heavy Duty: In roads.
5. Sewer Pipe Fitting and Riser to Cleanout: ASTM A74, Service class, cast-iron soil pipe and fittings.

B. PVC Cleanouts: PVC body with PVC threaded plug. Include PVC sewer pipe fitting and riser to cleanout of same material as sewer piping.

PART 3 - EXECUTION

3.1 TRENCHING

A. See Section 31 20 00 – Earth Moving.

B. Hand trim excavations for accurate placement of pipe to elevations indicated.

C. Backfill around sides and to top of pipe with cover material, tamp in-pace and compact, then complete backfilling.

3.2 IDENTIFICATION

A. Install continuous underground warning tape during backfilling of trench for all underground storm drainage piping. Locate below finished grade, directly over piping.

1. Use warning tape or detectable warning tape over ferrous piping.
2. Use detectable warning tape over nonferrous piping and over edges of underground structures.

B. Install warning tape a minimum of 12-inches below finish grade and directly above line of pipe.

3.3 PIPING APPLICATIONS

A. General: Include watertight joints.

B. Refer to Part 2 of this Section for detailed specifications for pipe and fitting products. Use pipe, fittings, and joining methods according to applications indicated.

3.4 SPECIAL PIPE COUPLING AND FITTING APPLICATIONS

A. Special Pipe Couplings: Use where required to join piping and no other appropriate method is specified. Do not use instead of specified joining methods.

1. Use the following pipe couplings for nonpressure applications:

a. Sleeve type to join piping, of same size, or with small difference in OD.
b. Increaser/reducer-pattern, sleeve type to join piping of different sizes.
c. Bushing type to join piping of different sizes where annular space between smaller piping's OD and larger piping's ID permits installation.

B. Special Pipe Fittings: Use where indicated. Include PE film, pipe encasement.

3.5 INSTALLATION, GENERAL

A. General Locations and Arrangements: Drawing plans and details indicate general location and arrangement of underground storm drainage piping. Location and arrangement of piping layout take design considerations into account. Install piping as indicated, to extent practical.

B. Verify existing pipe sizes and invert elevations at tie-in points before commencing installation of pipe. Notify the Architect/Engineer immediately upon discovering any discrepancies from inverts or sizes shown on the Drawings.

C. Verify that trench is ready to receive Work and excavations, dimensions, and elevations are as indicated on the Drawings.

D. Install pipe, fittings, and accessories in accordance with manufacturer's instructions. Seal watertight.

E. Install piping beginning at low point, true to grades and alignment indicated with unbroken continuity of invert. Place bell ends of piping facing upstream. Install gaskets, seals, sleeves, and couplings according to manufacturer's written instructions for use of lubricants, cements, and other installation requirements. Maintain swab or drag in line, and pull past each joint as it is completed.

F. Use manholes for changes in direction, unless fittings are indicated. Use fittings for branch connections, unless direct tap into existing sewer is indicated.

G. Use proper size increasers, reducers, and couplings where different sizes or materials of pipes and fittings are connected. Reducing size of piping in direction of flow is prohibited.

H. Install gravity-flow piping and connect to building's storm drains, of sizes and in locations indicated. Terminate piping as indicated.

1. Install piping pitched down in direction of flow, at minimum slope of 1/2-percent, unless otherwise indicated.

I. Extend storm drainage piping and connect to building's storm drains, of sizes and in locations indicated. Terminate piping as indicated.

J. Tunneling: Install pipe under streets or other obstructions that cannot be disturbed by tunneling, jacking, or a combination of both.

3.6 PIPE JOINT CONSTRUCTION AND INSTALLATION

A. General: Join and install pipe and fittings according to installations indicated.

B. Ductile-Iron Sewer Pipe with Ductile-Iron Fittings: According to AWWA C600.

1. Install PE film, pipe encasement over ductile-iron sewer pipe and ductile-iron fittings according to ASTM A 674 or AWWA C105.

C. HDPE Pipe and Fittings: As follows:

1. Join pipe, tubing, and fittings with couplings for watertight joints according to manufacturer's written instructions.
2. Install according to ASTM D 2321 and manufacturer's written instructions.
3. Install corrugated piping according to the Corrugated Polyethylene Pipe Association's "Recommended Installation Practices for Corrugated Polyethylene Pipe and Fittings."

D. PVC Sewer Pipe and Fittings: As follows:

1. Join pipe and gasketed fittings with gaskets according to ASTM D 2321.
2. Install according to ASTM D 2321.

E. Concrete Pipe and Fittings: Install according to ACPA's "Concrete Pipe Installation Manual." Use the following seals:

1. Round Pipe and Fittings: ASTM C 990 Preformed Flexible Joint Sealant.

F. System Piping Joints: Make joints using system manufacturer's couplings, unless otherwise indicated.

G. Join piping made of different materials or dimensions with couplings made for this application. Use couplings that are compatible with and that fit both systems' materials and dimensions.

3.7 MANHOLE (JUNCTION BOX) INSTALLATION

A. General: Install manholes, complete with appurtenances and accessories indicated.

B. Set tops of frames and covers flush with finished surface of manholes that occur in pavements. Set tops 1-inch above finished surface elsewhere, unless otherwise indicated.

C. Install precast concrete manhole sections with gaskets according to ASTM C891. Provide rubber joint gaskets complying with ASTM C443 at joints of sections.

1. Form bottom of excavation clean and smooth to correct elevation.
2. Place manhole sections plumb and level, trim to correct elevations.
3. Apply bituminous mastic coating at joints of sections.
4. Set cover frames and covers level without tipping, to correct elevations.

D. Construct cast-in-place manholes as indicated.

1. Form bottom of excavation clean and smooth to correct elevations.
2. Place concrete base pad, trowel top surface level.
3. Form and place manhole cylinder plumb and level, to correct dimensions and elevations. As work progresses, build in fabricated items and appurtenances.
4. Set cover frames and covers level without tipping, to correct elevations.

E. Masonry Work:

1. Maintain masonry courses to uniform dimension. Form vertical and horizontal joints of uniform thickness.
2. Lay cement brick masonry units in running bond. Course three (3) units to equal 8-inches.
3. Form flush mortar joints.
4. Lay masonry units in full bed of mortar, with full head joints, uniformly jointed with other work.
5. Install joint reinforcement at 16-inches on center.
6. Place joint reinforcement in first and second horizontal joints above base and below lid frame opening.

3.8 CATCH-BASIN INSTALLATION

A. General: Install catch basins to sizes and shapes indicated, complete with appurtenances and accessories indicated.

B. Set frames and grates to elevations indicated.

C. Install precast concrete catch basin sections with gaskets according to ASTM C891. Provide rubber joint gaskets complying with ASTM C443 at joints of sections.

1. Form bottom of excavation clean and smooth to correct elevation.
2. Place catch basin sections plumb and level, trim to correct elevations.
3. Apply bituminous mastic coating at joints of sections.

D. Construct cast-in-place catch basins as indicated.

1. Form bottom of excavation clean and smooth to correct elevations.
2. Place concrete base pad, trowel top surface level.
3. Form and place catch basin cylinder plumb and level, to correct dimensions and elevations. As work progresses, build in fabricated items and appurtenances.

E. Masonry Work:

1. Maintain masonry courses to uniform dimension. Form vertical and horizontal joints of uniform thickness.
2. Lay cement brick masonry units in running bond. Course three (3) units to equal 8-inches.
3. Form flush mortar joints.
4. Lay masonry units in full bed of mortar, with full head joints, uniformly jointed with other work.
5. Install joint reinforcement at 16-inches on center.
6. Place joint reinforcement in first and second horizontal joints above base and below lid frame opening.

3.9 CONCRETE PLACEMENT

A. Place cast-in-place concrete according to ACI 318 and ACI 350R.

3.10 CLEANOUT INSTALLATION

A. Install cleanouts and riser extension from sewer pipe to cleanout at grade. Use cast-iron soil pipe fittings in sewer pipes at branches for cleanouts and cast-iron soil pipe for riser extensions to cleanouts. Install piping so cleanouts open in direction of flow in sewer pipe.

B. Set cleanout frames and covers in earth in cast-in-place concrete block, 18 by 18 by 12 inches deep. Set with tops 1-inch above surrounding earth grade.

C. Set cleanout frames and covers in concrete pavement with tops flush with pavement surface.

3.11 TAP CONNECTIONS

A. Make connections to existing piping and underground structures so finished Work complies as nearly as practical with requirements specified for new Work.

B. Use commercially manufactured wye fittings for piping branch connections. Remove section of existing pipe; install wye fitting into existing piping; and encase entire wye fitting, plus 6-inch overlap, with not less than 6 inches of concrete with 28-day compressive strength of 3000 psi.

C. Make branch connections from side into existing piping, NPS 4 to NPS 20. Remove section of existing pipe; install wye fitting into existing piping; and encase entire wye with not less than 6 inches of concrete with 28-day compressive strength of 3000 psi.

D. Make branch connections from side into existing piping, NPS 21 or larger, or to underground structures by cutting opening into existing unit large enough to allow 3 inches of concrete to be

packed around entering connection. Cut end of connection pipe passing through pipe or structure wall to conform to shape of and be flush with inside wall, unless otherwise indicated. On outside of pipe or structure wall, encase entering connection in 6 inches of concrete for minimum length of 12 inches to provide additional support of collar from connection to undisturbed ground.

1. Use concrete that will attain minimum 28-day compressive strength of 3000 psi, unless otherwise indicated.
2. Use epoxy-bonding compound as interface between new and existing concrete and piping materials.

E. Protect existing piping and structures to prevent concrete or debris from entering while making tap connections. Remove debris or other extraneous material that may accumulate.

3.12 FIELD QUALITY CONTROL

A. Clear interior of piping and structures of dirt and superfluous material as work progresses. Maintain swab or drag in piping, and pull past each joint as it is completed.

1. In large, accessible piping, brushes and brooms may be used for cleaning.
2. Place plug in end of incomplete piping at end of day and when work stops.
3. Flush piping between manholes, catch basins, and other structures to remove collected debris.

B. Inspect interior of piping to determine whether line displacement or other damage has occurred. Inspect after approximately 24-inches of backfill is in place, and again at completion of Project.

1. Submit separate reports for each system inspection.
2. Defects requiring correction include the following:

a. Alignment: Less than full diameter of inside of pipe is visible between structures.
b. Deflection: Flexible piping with deflection that prevents passage of ball or cylinder of size not less than 95-percent of piping diameter.
c. Crushed, broken, cracked, or otherwise damaged piping.
d. Infiltration: Water leakage into piping.
e. Exfiltration: Water leakage from or around piping.

3. Replace defective piping using new materials, and repeat inspections until defects are within specified requirements.
4. Reinspect and repeat procedure until results are satisfactory.

C. Test new piping systems, and parts of existing systems that have been altered, extended, or repaired, for leaks and defects.

1. Do not enclose, cover, or put into service before inspection and approval.
2. Test completed piping systems according to authorities having jurisdiction.
3. Schedule tests and inspections by authorities having jurisdiction with at least 24-hours' advance notice.
4. Submit separate reports for each test.
5. Leaks and loss in test pressure constitute defects that must be repaired.
6. Replace leaking piping using new materials, and repeat testing until leakage is within allowances specified.

3.13 PROTECTION

A. Protect pipe, structures, and bedding cover from damage or displacement until backfill operations are completed.

END OF SECTION 33 41 00

SECTION 33 46 00 - SUBDRAINAGE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Subdrainage systems for the following:

a. Foundations.
b. Retaining walls.

1.3 LEED BUILDING GENERAL REQUIREMENTS

A. The University of South Carolina requires the Contractor to implement practices and procedures to meet the project's environmental performances goals, which include achieving LEED Certification. Specific project goals that may impact this area of work include: use of recycled-content materials; use of locally-manufactured materials; use of low-emitting materials; construction waste recycling; and the implementation of a construction indoor air quality management plan. The Contractor shall ensure that the requirements related to these goals, as defined in the sections below, are implemented to the fullest extent. Substitutions shall not be allowed if such changes comprise the stated LEED BUILDING Performance Criteria.

1.4 DEFINITIONS

A. ABS: Acrylonitrile-butadiene-styrene.

B. HDPE: High-density polyethylene.

C. PE: Polyethylene.

D. PP: Polypropylene.

E. PS: Polystyrene.

F. PVC: Polyvinyl chloride.

1.5 SUBMITTALS

A. Product Data: For drainage conduit, drainage panels, and geotextile fabrics.

1. Perforated pipe.
2. Drainage panels.
3. Geotextile fabrics.

1.6 COORDINATION

A. Drainage panel materials and installation shall be compatible with waterproofing of walls below grade.

PART 2 - PRODUCTS

2.1 PIPING MATERIALS

A. Refer to various application articles in Part 3 for applications of pipe, tube, fitting, and joining materials.

2.2 DRAINAGE PIPES AND FITTINGS

A. Perforated, PVC Sewer Pipe and Fittings: ASTM D2729, bell-and-spigot ends, for loose joints.

2.3 DRAINAGE CONDUIT

A. Pipe and Fittings: Perforated, smooth PVC complying with ASTM D 4216 and ASTM D 2729.

1. Size: 6-inches high by approximately 2-1/4 inches thick with a minimum flow rate equal to NPS 4 pipe.
2. Fittings: PVC with NPS 4 outlet connection.
3. Couplings: PVC.

2.4 MOLDED-SHEET DRAINAGE PANELS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. American Wick Drain Corporation.
2. Grace, W. R. & Co.; Construction Products Div.
3. GREENSTREAK/Western Textile Products.
4. JDR Enterprises, Inc.

5. Ling Industrial Fabrics, Inc.
6. TC Mirafi.

B. Description: Prefabricated, composite panels, 36- to 60-inches wide, and manufactured with geotextile facing laminated to molded-plastic drainage core.

C. Drainage Core: Three-dimensional, nonbiodegradable, molded PP or PS.

1. Minimum Compressive Strength: 10,000-lbf/sq. ft. when tested according to ASTM D1621.
2. Minimum Flow Rate: 2.8-gpm per at hydraulic gradient of 1.0 and compressive stress of 25-psig when tested according to ASTM D4716.

D. Geotextile: Nonwoven needle-punched geotextile, manufactured for subsurface drainage, made from polyolefins or polyesters; with elongation greater than 50-percent; complying with the following properties determined according to AASHTO M 288:

1. Survivability: Class 2.
2. Apparent Opening Size: No. 70 sieve, maximum.
3. Permitivity: 0.1 per second, minimum.

E. Film Backing: Polymeric film bonded to drainage core surface.

2.5 FABRIC DRAINAGE PANELS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Akzo Nobel Geosynthetics Co.
2. GSE Lining Technology, Inc.
3. JDR Enterprises, Inc.
4. Strata Systems, Inc.
5. Tensar Earth Technologies, Inc.

B. Description: Prefabricated, composite drainage panels, made with drainage core and filter fabric, for use as part of foundation and retaining-wall drainage system.

C. Drainage Core: Open-construction, resilient, 0.8-inch-thick, nylon-filament mesh.

1. Minimum Flow Rate: 2.4-gpm per foot at hydraulic gradient of 1.0 and normal pressure of 3,600-psig when tested according to ASTM D4716.

D. Drainage Core: 3-dimensional, PE strand, 0.25-inch-thick, nonwoven net.

1. Minimum Flow Rate: 5-gpm per foot at hydraulic gradient of 1.0 and normal pressure of 3,600-psig when tested according to ASTM D4716.

E. Filter Fabric: Nonwoven geotextile filter fabric of PP or polyester fibers, or combination of both. Flow rates range from 120- to 200-gpm per sq. ft. when tested according to ASTM D4491.

2.6 INSULATION DRAINAGE PANELS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Diversifoam Products.
2. Dow Chemical Company (The).
3. Owens Corning.
4. Tenneco Building Products.

B. Description: Extruded-polystyrene board insulation complying with ASTM C 578; fabricated with tongue-and-groove edges and with one side having grooved drainage channels, faced with manufacturer's standard, nonwoven geotextile filter fabric.

1. Type IV, 1.6-lb/cu. ft. minimum density and 25-psig minimum compressive strength.

2.7 SOIL MATERIALS

A. See Section 312000 for additional information.

B. Impervious Fill: Clay, gravel, and sand mixture.

C. Drainage Fill: Washed, evenly graded mixture of crushed stone, or crushed or uncrushed gravel, ASTM D448, coarse aggregate, Size No. 57, with 100-percent passing 1-1/2-inch sieve and not more than 5-percent passing No. 8 sieve.

2.8 GEOTEXTILE FILTER FABRICS

A. Woven or nonwoven geotextile filter fabric of PP or polyester fibers, or combination of both. Flow rates range from 110- to 330-gpm per sq. ft. when tested according to ASTM D4491. Available styles are flat and sock.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine surfaces and areas for suitable conditions where subdrainage systems are to be installed.

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

3.2 EARTHWORK

A. Excavating, trenching, and backfilling are specified in Section 31 20 00, 31 50 00 and 33 46 00.

3.3 SUBDRAINAGE SYSTEM APPLICATIONS

A. NPS 4 Piping:

1. Perforated, PVC sewer pipe and fittings for loose, bell-and-spigot joints.

3.4 FOUNDATION DRAINAGE INSTALLATION

A. Bottom Impervious Fill: Place impervious fill material on subgrade adjacent to bottom of footing after concrete footings have been cured and forms removed. Place and compact impervious fill to dimensions indicated, but not less than 6-inches deep and 12-inches wide.

B. Drainage Fill: Place supporting layer of drainage fill over compacted subgrade to compacted depth of not less than 4-inches. After installing drainage piping, add drainage fill to width of at least 6-inches on side away from wall and to top of pipe to perform tests. After satisfactory testing, cover piping to width of at least 6-inches on side away from footing and above top of pipe to within 12-inches of finish grade. Place drainage fill in layers not exceeding 3-inches in loose depth; compact each layer placed.

1. Before installing drainage fill, lay flat-style geotextile filter fabric in trench and overlap trench sides. After installing drainage fill, wrap top of drainage fill with flat-style geotextile filter fabric.
2. Encase pipe with sock-style geotextile filter fabric before installing pipe. Connect sock sections with electrical tape.

C. Install vertical drainage panel as follows:

1. Coordinate placement with other drainage materials.
2. Lay perforated, PE or PVC drainage pipe at base of footing as described elsewhere in this Specification. Do not install aggregate.
3. Mark horizontal calk line on wall at a point 6-inches less than panel width above footing bottom. Before marking wall, subtract footing width.
4. Separate 4-inches of fabric at beginning of roll and cut away 4-inches of core. Wrap fabric around end of remaining core.
5. Wrap bottom of panel around drainage pipe.
6. Attach panel to wall at horizontal mark and at beginning of pipe. Place core side of panel against wall. Use concrete nails with washers through product cylinders to attach panel to wall. Place nails from 2- to 6-inches below top of panel, approximately 48-inches apart. Some manufacturers use construction adhesives, metal stick pins, or double-sided tape. Do not penetrate waterproofing. Before using adhesives, discuss with waterproofing manufacturer.
7. If another panel is required on the same row, cut away 4-inches of installed panel core and wrap fabric over new panel.
8. If additional rows of panel are required, overlap lower panel with 4-inches of fabric.
9. Cut panel as necessary to keep top 12-inches below finish grade.
10. For inside corners, bend panel. For outside corners, cut core to provide 3-inches for overlap.
11. Do not use drainage panels as protection over waterproof membrane, unless otherwise approved by waterproofing membrane manufacturer.

D. Fill to Grade: Place native fill material over compacted drainage fill. Place material in loose-depth layers not exceeding 6-inches. Thoroughly compact each layer. Fill to finish elevations and slope away from building.

3.5 RETAINING-WALL DRAINAGE INSTALLATION

A. Drainage Fill: Place supporting layer of drainage fill over compacted subgrade to compacted depth of not less than 4-inches. After installing drainage piping, add drainage fill to width of at least 6-inches on side away from wall and to top of pipe to perform tests. After satisfactory testing, cover piping to width of at least 6-inches on side away from footing and above top of pipe to within 12-inches of finish grade. Place drainage fill in layers not exceeding 3-inches in loose depth; compact each layer placed.

1. Before installing drainage fill, lay flat-style geotextile filter fabric in trench and overlap trench sides. After installing drainage fill, wrap top of drainage fill with flat-style geotextile filter fabric.
2. Encase pipe with sock-style geotextile filter fabric before installing pipe. Connect sock sections with electrical tape.
3. After installing drainage fill, place one layer of flat-style geotextile filter fabric over top of drainage fill, overlapping edges at least 4-inches.

B. Install vertical drainage panels as follows:

1. Coordinate placement with other drainage materials.
2. Lay perforated, PE or PVC drainage pipe at base of footing as described elsewhere in this Specification. Do not install aggregate.
3. If weep holes are used in lieu of drainage pipe, cut 1/2-inch-diameter holes on core side at weep-hole locations. Do not cut fabric.
4. Mark horizontal calk line on wall at a point 6-inches less than panel width above footing bottom. Before marking wall, subtract footing width.
5. Separate 4-inches of fabric at beginning of roll and cut away 4-inches of core. Wrap fabric around end of remaining core.
6. Wrap bottom of panel around drainage pipe.
7. Attach panel to wall at horizontal mark and at beginning of wall corner. Place core side of panel against wall. Use concrete nails with washers through product. Use nails from 2- to 6-inches below top of panel, approximately 48-inches apart. Do not penetrate waterproofing.
8. If another panel is required on the same row, cut away 4-inches of installed panel core and wrap fabric over new panel.
9. If additional rows of panel are required, overlap lower panel with 4-inches of fabric.
10. Cut panel as necessary to keep top 12-inches below finish grade.
11. For inside corners, bend panel. For outside corners, cut core to provide 3-inches for overlap.
12. Do not use drainage panels as protection over waterproof membrane, unless otherwise approved by waterproofing membrane manufacturer.

C. Fill to Grade: Place native fill material over compacted drainage fill. Place material in loose-depth layers not exceeding 6inches. Thoroughly compact each layer. Fill to finish grade.

3.6 PIPING INSTALLATION

A. Install piping beginning at low points of system, true to grades and alignment indicated, with unbroken continuity of invert. Bed piping with full bearing in filtering material. Install gaskets, seals, sleeves, and couplings according to manufacturer's written instructions and other requirements indicated.

1. Foundation Subdrainage: Install piping pitched down in direction of flow, at a minimum slope of 0.5-percent and with a minimum cover of 36-inches, unless otherwise indicated.

2. Retaining-Wall Subdrainage: When water discharges at end of wall into stormwater piping system, install piping pitched down in direction of flow, at a minimum slope of 0.5-percent and with a minimum cover of 36-inches, unless otherwise indicated. However, when water discharges through wall weep holes, pipe may be installed with a minimum slope of zero percent.
3. Lay perforated pipe with perforations down.
4. Lay open-joint pipe spaced as indicated on Drawings or, if not indicated, with 1/4-inch space between ends. Cover top two-thirds of joint opening with open-joint screening material and tie with corrosion-resistant wire.
5. Excavate recesses in trench bottom for bell ends of pipe. Lay pipe with bells facing upslope and with spigot end entered fully into adjacent bell.

B. Use increasers, reducers, and couplings made for different sizes or materials of pipes and fittings being connected. Reduction of pipe size in direction of flow is prohibited.

C. Install PVC piping according to ASTM D2321.

3.7 PIPE JOINT CONSTRUCTION

A. Join perforated, PVC pipe and fittings according to ASTM D2729, with loose, bell-and-spigot joints.

3.8 CONNECTIONS

A. Piping installation requirements are specified in other Division 15 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.

3.9 FIELD QUALITY CONTROL

A. Testing: After installing drainage fill to top of pipe, test drain piping with water to ensure free flow before backfilling. Remove obstructions, replace damaged components, and repeat test until results are satisfactory.

3.10 CLEANING

A. Clear interior of installed piping and structures of dirt and other superfluous material as work progresses. Maintain swab or drag in piping and pull past each joint as it is completed. Place plugs in ends of uncompleted pipe at end of each day or when work stops.

END OF SECTION 33 46 00